Instruction Manual
PN 51-Xmt-C/rev.B
October 2005

Model Solu Comp® Xmt-C

Two-Wire Contacting Conductivity Transmitter



ROSEMOUNT® Analytical

EMERSON™ Process Management

ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Rosemount Analytical designs, manufactures, and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use, and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using, and maintaining Rosemount Analytical products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- Read all instructions prior to installing, operating, and servicing the product. If this Instruction Manual is not the correct manual, telephone 1-800-654-7768 and the requested manual will be provided. Save this Instruction Manual for future reference.
- If you do not understand any of the instructions, contact your Rosemount representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look alike substitutions may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

NOTICE

If a Model 375 Universal Hart® Communicator is used with these transmitters, the software within the Model 375 may require modification. If a software modification is required, please contact your local Emerson Process Management Service Group or National Response Center at 1-800-654-7768.

About This Document

This manual contains instructions for installation and operation of the Model Xmt-C Two-Wire Contacting Conductivity Transmitter. The following list provides notes concerning all revisions of this document.

Rev. Level	Date	Notes
A	3/05	This is the initial release of the product manual. The manual has been reformatted to reflect the Emerson documentation style and updated to reflect any changes in the product offering. This manual contains information on HART Smart and FOUNDATION Fieldbus versions of Model Solu Comp Xmt-C.
B	9/05	Add Foundation fieldbus agency approvals and FISCO version.

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EMERSON Process Management

QUICK START GUIDE

FOR MODEL SOLU COMP Xmt-C TRANSMITTER

1. Refer to page 11 for installation instructions.
2. Wire conductivity sensor to the transmitter. Refer to the sensor instruction sheet for details.
3. Once connections are secure and verified, apply DC power to the transmitter.
4. When the transmitter is powered up for the first time, **Quick Start** screens appear. Using **Quick Start** is easy.
   a. A blinking field shows the position of the cursor.
   b. Use the ◀ or ▶ key to move the cursor left or right. Use the ▲ or ▼ key to move the cursor up or down or to increase or decrease the value of a digit. Use the ▲ or ▼ key to move the decimal point.
   c. Press ENTER to store a setting. Press EXIT to leave without storing changes. Pressing EXIT also returns the display to the previous screen.

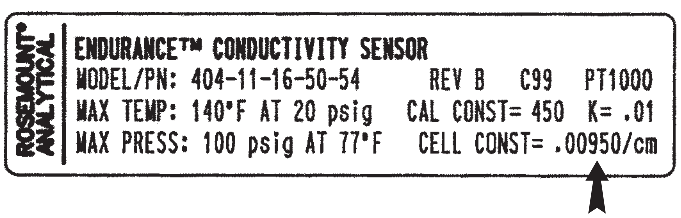
```
Measure?             Cond
Resistivity            >>
```

```
Measure?
TDS      Custom        >>
```

5. Choose measurement: **Conductivity, Resistivity, Total Dissoved Solids,** or **Custom**.

```
Cell Constant?
1.0000/cm
```

6. Enter the cell constant. See label attached to sensor.



If there is no cell constant on the label, calculate it from the equation:

$$\text{cell const} = K\left(\frac{500 + \text{cal const}}{1000}\right)$$

```
Temperature in?
°C                     °F
```

7. Choose temperature units: **°C** or **°F**.

```
Enter Data Pts
Ref Temp            Slope
```

```
Concentration
Units?    %    ppm   none
```

8. If you selected **Custom**, you must enter the appropriate conductivity and concentration data points. From the main display, press MENU. Choose **Program** followed by **Measurement** and **Custom**. The screen shown at left appears. Select **Enter Data Pts**. Follow the prompts and enter the display units, the number of data points, and enter the concentration and conductivity data points. Enter the reference temperature and the temperature coefficient (slope). Once the analyzer has been configured, press EXIT. For a guide to the program menu, see the menu trees on pages 5 & 6.

9. To change output settings, to scale the 4-20 mA output, to change measurement-related settings from the default values, and to set security codes, press MENU. Select Program and follow the prompts. Refer to the menu tree on pages 5 & 6.

10. To return the transmitter to default settings, choose **ResetAnalyzer** in the Program menu.

MODEL XMT-C TWO-WIRE CONDUCTIVITY TRANSMITTER

TABLE OF CONTENTS

TABLE OF CONTENTS CONT'D

LIST OF FIGURES

SECTION 1.0
DESCRIPTION AND SPECIFICATIONS

Model Xmt™ Family of Two-wire Transmitters



- CHOICE OF COMMUNICATION PROTOCOLS: HART® or FOUNDATION® Fieldbus
- CLEAR, EASY-TO-READ two-line display shows commissioning menus and process measurement displays in English.
- SIMPLE TO USE MENU STRUCTURE.
- MEASURES CONDUCTIVITY, RESISTIVITY, TOTAL DISSOLVED SOLIDS, OR CUSTOM CURVE VARIABLE.
- AUTOMATIC TEMPERATURE SENSOR RECOGNITION simplifies start up.
- AUTOMATIC COMPENSATION FOR SENSOR CABLE RESISTANCE improves accuracy of high conductivity/ low resistivity measurements.*
- TEMPERATURE COMPENSATION ALGORITHMS include percent slope, ultra-pure water, cation conductivity, and no compensation.

**Patent pending*

1.1 FEATURES AND APPLICATIONS

The Solu Comp Model Xmt family of transmitters can be used to measure pH, ORP, conductivity (using either contacting or toroidal sensors), resistivity, oxygen (ppm and ppb level), free chlorine, total chlorine, monochloramine and ozone in a variety of process liquids. The Xmt is compatible with most Rosemount Analytical sensors. See the Specification sections for details.

The transmitter has a rugged, weatherproof, corrosion-resistant enclosure (NEMA 4X and IP65). The panel mount version fits standard ½ DIN panel cutouts, and its shallow depth is ideally suited for easy mounting in cabinet-type enclosures. A panel mount gasket is included to maintain the weather rating of the panel. Surface/pipe mount enclosure includes self-tapping screws for surface mounting. A pipe mounting accessory kit is available for mounting to a 2-inch pipe.

The transmitter has a two-line 16-character display. Menu screens for calibrating and registering choices are simple and intuitive. Plain language prompts guide the user through the procedures. There are no service codes to enter before gaining access to menus.

Two digital communication protocols are available: HART (model option -HT) and FOUNDATION fieldbus (model option -FF). Digital communications allow access to AMS (Asset Management Solutions). Use AMS to set up and configure the transmitter, read process variables, and troubleshoot problems from a personal computer or host anywhere in the plant.

The seven-button membrane-type keypad allows local programming and calibrating of the transmitter. The HART Model 375 communicator can also be used for programming and calibrating the transmitter.

The Model XMT-C Transmitter measures conductivity, resistivity, total dissolved solids, or % concentration. It can also be configured, using the "Custom Curve" feature, to measure ppm, %, or a no unit variable according to a programmable conductivity vs. variable curve. The transmitter automatically recognizes the type of RTD (Pt100 or Pt1000) being used. Measurements are automatically corrected for the resistance of the sensor cable to improve accuracy of high conductivity readings. The Xmt-C provides several temperature compensation algorithms: linear slope, ultra-pure water (neutral salt), or cation conductivity. Alternatively, temperature compensation feature can be turned off to provide display of raw conductivity.

1.2 SPECIFICATIONS

1.2.1 GENERAL SPECIFICATIONS

Case: ABS. Pipe, surface, and panel mount versions are NEMA 4X/CSA 4 (IP65)

Dimensions

Panel (code -10): 6.10 x 6.10 x 3.72 in. (155 x 155 x 94.5 mm)

Surface/Pipe (code -11): 6.23 x 6.23 x 3.23 in. (158 x 158 x 82 mm); see page 15 for dimensions of pipe mounting bracket.

Conduit openings: Accepts PG13.5 or 1/2 in. conduit fittings

Ambient Temperature: 32 to 122°F (0 to 50°C). Some degradation of display above 50°C.

Storage Temperature: -4 to 158°F (-20 to 70°C)

Relative Humidity: 10 to 90% (non-condensing)

Weight/Shipping Weight: 2 lb/3 lb (1 kg/1.5 kg)

Display: Two line, 16-character display. Character height: 4.8 mm; first line shows process variable, second line shows process temperature and output current. Fault and warning messages, when triggered, alternate with temperature and output readings.

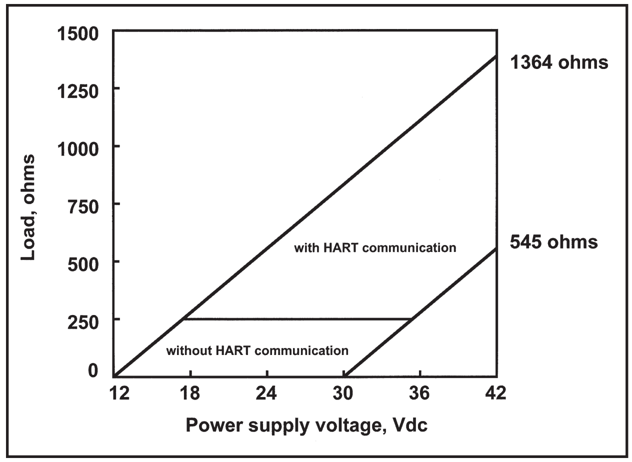
During calibration and programming, messages, prompts, and editable values appear on the two-line display.

Temperature resolution: 0.1°C (≤99.9°C);
1°C (≥100°C)

Hazardous Location Approval: For details, see specifications for the measurement of interest.

RFI/EMI: EN-61326 CE

Solu Comp is a registered trademark of Rosemount Analytical.
Xmt is a trademark of Rosemount Analytical.
HART is a registered trademark of the HART Communication Foundation.
FOUNDATION is a registered trademark of Fieldbus Foundation.



DIGITAL COMMUNICATIONS:

HART —

Power & Load Requirements: Supply voltage at the transmitter terminals should be at least 12 Vdc. Power supply voltage should cover the voltage drop on the cable plus the external load resistor required for HART communications (250 Ω minimum). Minimum power supply voltage is 12 Vdc. Maximum power supply voltage is 42.4 Vdc. The graph shows the supply voltage required to maintain 12 Vdc (upper line) and 30 Vdc (lower line) at the transmitter terminals when the current is 22 mA.

Analog Output: Two-wire, 4-20 mA output with superimposed HART digital signal. Fully scalable over the operating range of the sensor.

Output accuracy: ±0.05 mA

FOUNDATION FIELDBUS —

Power & Load Requirements: A power supply voltage of 9-32 Vdc at 13 mA is required.

Fieldbus **I**ntrinsically **S**afe **CO**ncept/FISCO-compliant versions of Model Xmt Foundation Fieldbus transmitters are available.

1.2.2 FUNCTIONAL SPECIFICATIONS

Automatic Temperature Compensation:
3-wire Pt 100 or Pt 1000 RTD
Conductivity: 0 to 200°C (32 to 392°F)
Resistivity: 0 to 100°C (32 to 212°F)
Low Conductivity: 0 to 100°C (32 to 212°F)

Diagnostics: The internal diagnostics can detect:

Calibration Error	ROM Failure
Temperature Slope Error	Zero Error
High Temperature Warning	CPU Failure
Low Temperature Warning	Input Warning

Once one of the above is diagnosed, the Xmt-C will display a message describing the problem.

Digital Communications:

HART: PV, SV, and TV assignable to measurement (conductivity, resistivity, or concentration), temperature, and raw conductivity. Raw conductivity is measured conductivity before temperature correction.

Fieldbus: Three AI blocks assignable to measurement (conductivity, resistivity, or concentration), temperature, and raw conductivity. Raw conductivity is measured conductivity before temperature correction. Execution time 75 msec. One PID block; execution time 150 msec. Device type: 4084. Device revision: 1. Certified to ITK 4.5.

1.2.3 TRANSMITTER SPECIFICATIONS @ 25°C

Measured Range: 0-20,000 µS/cm

Accuracy: ± 0.7% of reading and ± 0.002 µS/cm

Repeatability: ± 0.25% of reading

Temperature Accuracy: ± 0.2°C between 0 and 50°C; ± 0.5°C above 50°C (excludes inaccuracies in sensor)

Temperature Compensation: Slope 0-5%/°C, ultra-pure water, cation conductivity, or raw (uncompensated) conductivity.

Compatible RTD: 100Ω or 1000Ω with automatic recognition

Ambient Temperature Coefficient:
± 0.05% of reading/°C

Maximum Cable Length: 200 ft (61 m)

1.2.4 LOOP SPECIFICATIONS

Accuracy: under controlled laboratory conditions at 25°C (77°F) with perfectly calibrated ENDURANCE sensor of appropriate cell constant:

Cell Constant	Range	Loop accuracy
0.01/cm	up to 50 µS/cm	±0.7% of reading ±0.002 µS/cm
0.1/cm	0.4 to 50 µS/cm 50 to 200 µS/cm	±0.7% of reading ±2% of reading
1.0/cm	4 to 5000 µS/cm 5000 to 20,000 µS/cm	±0.7% of reading ±2% of reading

Calibration: Calibrate against previously calibrated standard sensor and analyzer, or calibrate against solution of known conductivity.

1.2.5 SENSOR SELECTION GUIDELINES

Cell Constant	Suggested Conductivity Range
0.01/cm	up to 50 µS/cm
0.1/cm	0.4 to 500 µS/cm
1.0/cm	4 to 20,000 µS/cm

Note: *The conductivity values shown in the above chart are for UNCOMPENSATED (or RAW) conductivity at 25°C. Maximum range values will vary due to temperature compensation selection, process temperature, and other process conditions.*

RECOMMENDED SENSORS:

Model 140	Retractable Conductivity
Model 141	Insertion High Conductivity
Model 142	Insertion Low Conductivity
Model 150	Insertion/Submersion Conductivity
Model 400/VP	Screw-In Low Conductivity
Model 401	Screw-In High Conductivity
Model 402/VP	Retractable Conductivity
Model 403/VP	Sanitary Conductivity
Model 404	Low Flow Conductivity

1.3 HAZARDOUS LOCATION APPROVALS

Intrinsic Safety:

Class I, II, III, Div. 1
Groups A-G
T4 Tamb = 50°C

Class I, II, III, Div. 1
Groups A-G
T4 Tamb = 50°C

ATEX

1180
II 1 G
Baseefa04ATEX0214X
EEx ia IIC T4
Tamb = 0°C to 50°C

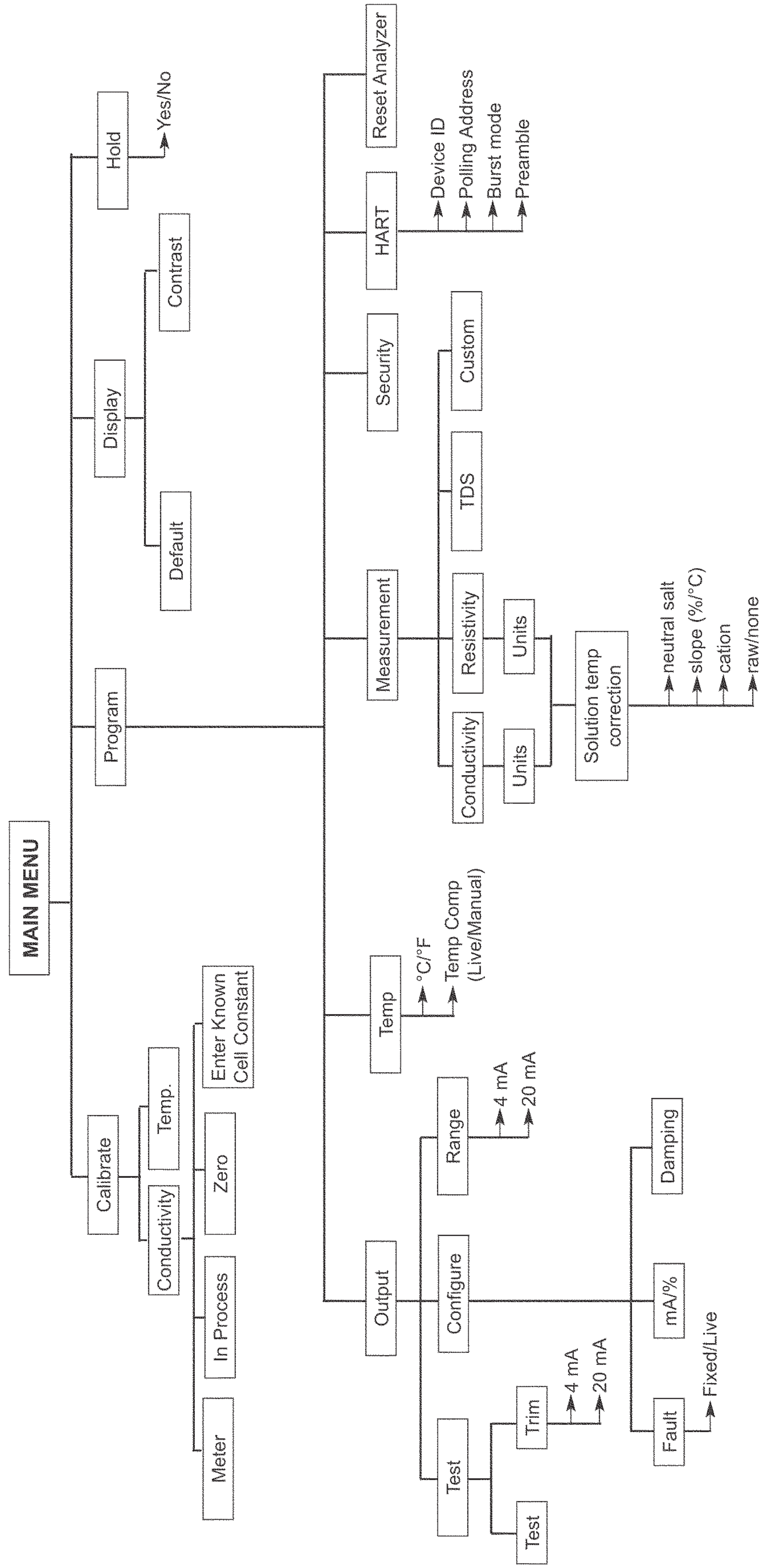
Non-Incendive:

Class I, Div. 2, Groups A-D
Dust Ignition Proof
Class II & III, Div. 1, Groups E-G
NEMA 4/4X Enclosure

Class I, Div. 2, Groups A-D
Dust Ignition Proof
Class II & III, Div. 1, Groups E-G
NEMA 4/4X Enclosure
T4 Tamb = 50°C

1.4 MENU TREE FOR MODEL XMT-C-HT

FIGURE 1-1. MENU TREE FOR MODEL SOLU COMP XMT-C-HT TRANSMITTER



1.5 MENU TREE FOR MODEL XMT-C-FF

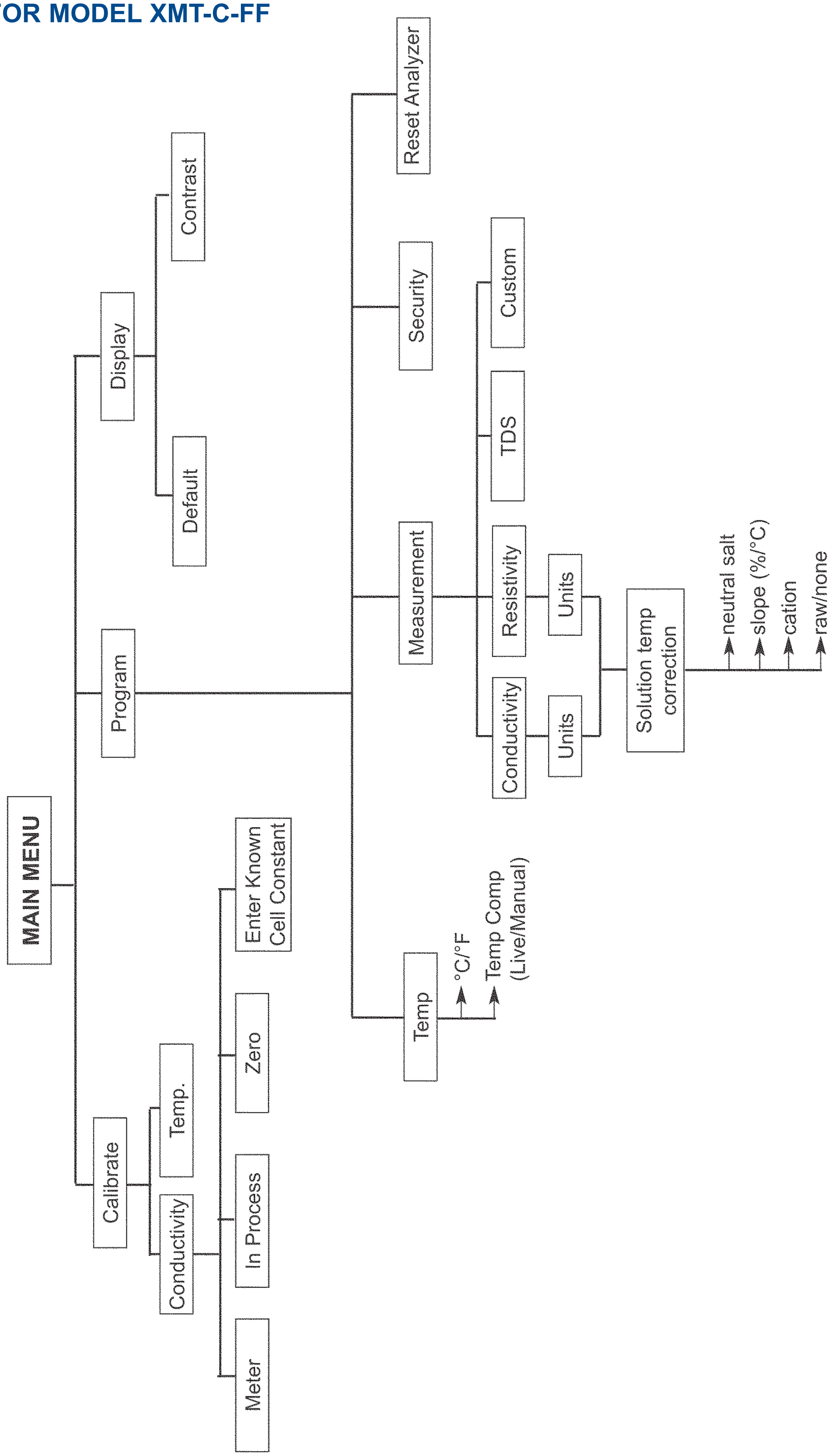


FIGURE 1-2. MENU TREE FOR MODEL SOLU COMP XMT-C-FF TRANSMITTER

1.6 HART COMMUNICATIONS

1.6.1 OVERVIEW OF HART COMMUNICATION

HART (highway addressable remote transducer) is a digital communication system in which two frequencies are superimposed on the 4 to 20 mA output signal from the transmitter. A 1200 Hz sine wave represents the digit 1, and a 2400 Hz sine wave represents the digit 0. Because the average value of a sine wave is zero, the digital signal adds no dc component to the analog signal. HART permits digital communication while retaining the analog signal for process control.

The HART protocol, originally developed by Fisher-Rosemount, is now overseen by the independent HART Communication Foundation. The Foundation ensures that all HART devices can communicate with one another. For more information about HART communications, call the HART Communication Foundation at (512) 794-0369. The internet address is *http://www.hartcomm.org*.

1.6.2 HART INTERFACE DEVICES

The Model 375 HART Communicator is a hand-held device that provides a common link to all HART SMART instruments and allows access to AMS (Asset Management Solutions). Use the HART communicator to set up and control the XMT-C-HT and to read measured variables. Press ON to display the on-line menu. All setup menus are available through this menu.

HART communicators allow the user to view measurement data (conductivity, TDS, resistivity, and temperature), program the transmitter, and download information from the transmitter for transfer to a computer for analysis. Downloaded information can also be sent to another HART transmitter. Either a hand-held communicator, such as the Rosemount Model 375, or a computer can be used. HART interface devices operate from any wiring termination point in the 4 - 20 mA loop. A minimum load of 250 ohms must be present between the transmitter and the power supply. See Figure 1-4.

If your communicator does not recognize the Model XMT-C transmitter, the device description library may need updating. Call the manufacturer of your HART communication device for updates.

1.7 FOUNDATION FIELDBUS

Figure 1-3 shows a Xmt-C-FF being used to measure conductivity. The figure also shows three ways in which Fieldbus communication can be used to read process variables and configure the transmitter.

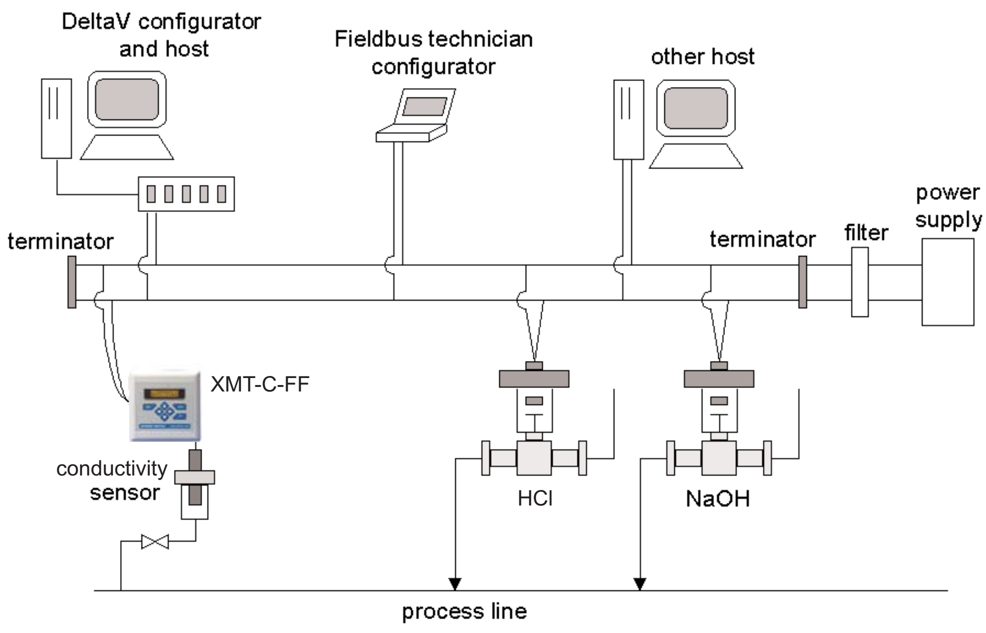


FIGURE 1-3. CONFIGURING MODEL XMT-C TRANSMITTER WITH FOUNDATION FIELDBUS

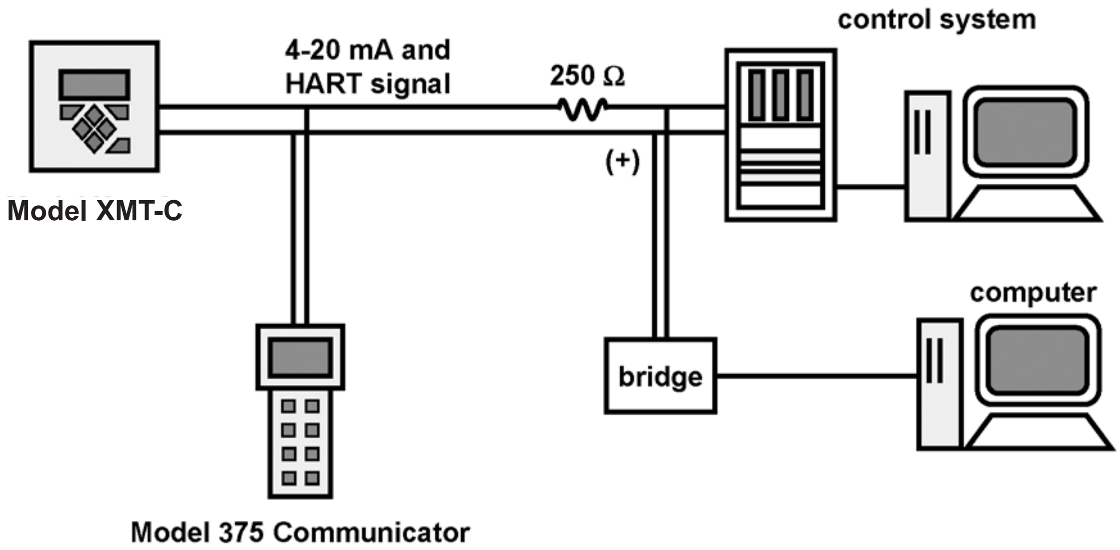


FIGURE 1-4. HART and FOUNDATION™ Fieldbus Communicators.

Both the Rosemount Model 375 (or 275) and a computer can be used to communicate with a HART transmitter. The 250 ohm load (minimum) must be present between the transmitter and the power supply.

1.8 ASSET MANAGEMENT SOLUTIONS

Asset Management Solutions (AMS) is software that helps plant personnel better monitor the performance of analytical instruments, pressure and temperature transmitters, and control valves. Continuous monitoring means maintenance personnel can anticipate equipment failures and plan preventative measures before costly breakdown maintenance is required.

AMS uses remote monitoring. The operator, sitting at a computer, can view measurement data, change program settings, read diagnostic and warning messages, and retrieve historical data from any HART-compatible device, including the Model XMT-C transmitter. Although AMS allows access to the basic functions of any HART compatible device, Rosemount Analytical has developed additional software for that allows access to all features of the Model Xmt-C transmitter.

AMS can play a central role in plant quality assurance and quality control. Using AMS Audit Trail, plant operators can track calibration frequency and results as well as warnings and diagnostic messages. The information is available to Audit Trail whether calibrations were done using the infrared remote transmitter, the Model 375 HART communicator, or AMS software.

AMS operates in Windows 2000, NT, and XP operating systems. See Figure 1-5 for a sample screen. AMS communicates through a HART-compatible modem with any HART transmitters, including those from other manufacturers. AMS is also compatible with FOUNDATION Fieldbus, which allows future upgrades to Fieldbus instruments.

Rosemount Analytical AMS windows provide access to all transmitter measurement and configuration variables. The user can read raw data, final data, and program settings and can reconfigure the transmitter from anywhere in the plant.

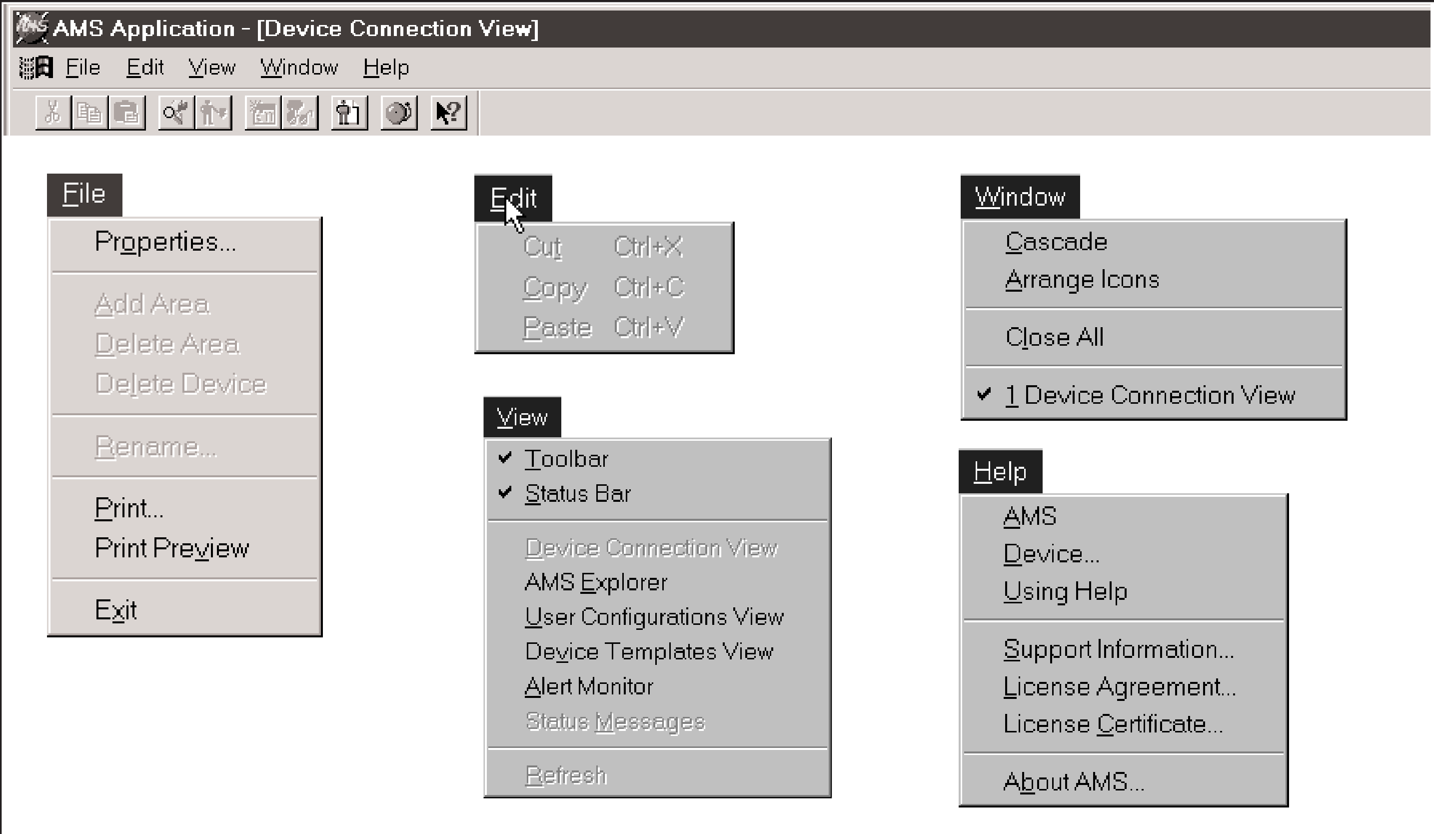


FIGURE 1-5. AMS MAIN MENU TOOLS

1.9 ORDERING INFORMATION

The Solu Comp Model Xmt Two-Wire Transmitter is intended for conductivity and resistivity measurements using contacting conductivity sensors.

MODEL Xmt	SMART TWO-WIRE MICROPROCESSOR TRANSMITTER
CODE	**REQUIRED SELECTION**
P	pH/ORP
CODE	**REQUIRED SELECTION**
HT	Analog 4-20 mA output with superimposed HART digital signal
FF	Foundation fieldbus digital output
FI	Foundation fieldbus digital output with FISCO
CODE	**REQUIRED SELECTION**
10	Panel mounting enclosure
11	Pipe/Surface mounting enclosure (pipe mounting requires accessory kit PN 23820-00)
CODE	**AGENCY APPROVALS**
60	No approval
67	FM approved intrinsically safe and non-incendive (when used with appropriate sensor and safety barrier)
69	CSA approved intrinsically safe and non-incendive (when used with appropriate sensor and safety barrier)
73	ATEX approved intrinsically safe (when used with appropriate sensor and safety barrier)
Xmt-P-HT-10-67	**EXAMPLE**

1.10 ACCESSORIES

POWER SUPPLY: Use the Model 515 Power Supply to provide dc loop power to the transmitter. The Model 515 provides two isolated sources at 24Vdc and 200 mA each. For more information refer to product data sheet 71-515.

ALARM MODULE: The Model 230A alarm Module receives the 4-20 mA signal from the XMT-C-HT transmitter and activates two alarm relays. High/high, low/low, and high/low are available. Hysteresis (deadband) is also adjustable. For more information, refer to product data sheet 71-230A.

HART COMMUNICATOR: The Model 375 HART communicator allows the user to view measurement values as well as to program and configure the transmitter. The Model 375 attaches to any wiring terminal across the output loop. A minimum 250 Ω load must be between the power supply and transmitter. Order the Model 375 communicator from Emerson Process Management. Call (800) 999-9307.

ACCESSORIES

MODEL/PN	DESCRIPTION
515	DC loop power supply (see product data sheet 71-515)
230A	Alarm module (see product data sheet 71-230A)
23820-00	2-in. pipe mounting kit
9240048-00	Stainless steel tag, specify marking
23554-00	Gland fittings PG 13.5, 5 per package

SECTION 2.0
INSTALLATION

2.1 UNPACKING AND INSPECTION

Inspect the shipping container. If it is damaged, contact the shipper immediately for instructions. Save the box. If there is no apparent damage, remove the transmitter. Be sure all items shown on the packing list are present. If items are missing, immediately notify Rosemount Analytical.

Save the shipping container and packaging. They can be reused if it is later necessary to return the transmitter to the factory.

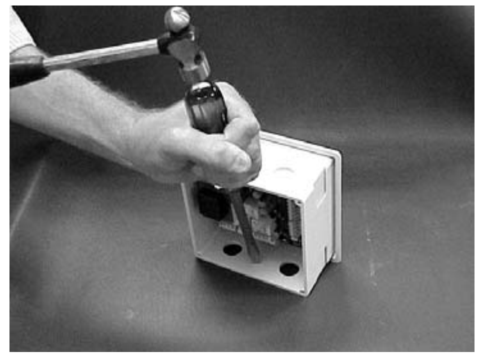


FIGURE 2-1. Removing the Knockouts

2.2 INSTALLATION

1. Although the transmitter is suitable for outdoor use, do not install it in direct sunlight or in areas of extreme temperatures.
2. Install the transmitter in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
3. Keep the transmitter and sensor wiring at least one foot from high voltage conductors. Be sure there is easy access to the transmitter.
4. The transmitter is suitable for panel (Figure 2-3), pipe (Figure 2-4), or surface (Figure 2-5) mounting.
5. The transmitter case has two 1/2-inch (PG13.5) conduit openings and either three or four 1/2-inch knockouts. The panel mount XMT-C-HT has four knockouts. The pipe/surface mount transmitter has three knockouts*. One conduit opening is for the power/output cable; the other opening is for the sensor cable.

   Figure 1 shows how to remove a knockout. The knockout grooves are on the outside of the case. Place the screwdriver blade on the inside of the case and align it approximately along the groove. Rap the screwdriver sharply with a hammer until the groove cracks. Move the screwdriver to an uncracked portion of the groove and continue the process until the knockout falls out. Use a small knife to remove the flash from the inside of the hole.
6. Use weathertight cable glands to keep moisture out to the transmitter. If conduit is used, plug and seal the connections at the transmitter housing to prevent moisture from getting inside the instrument.
7. To reduce the likelihood of stress on wiring connections, do not remove the hinged front panel (-11 models) from the base during wiring installation. Allow sufficient wire leads to avoid stress on conductors.

NEMA plug may be supplied instead of knockout for pipe/surface version.

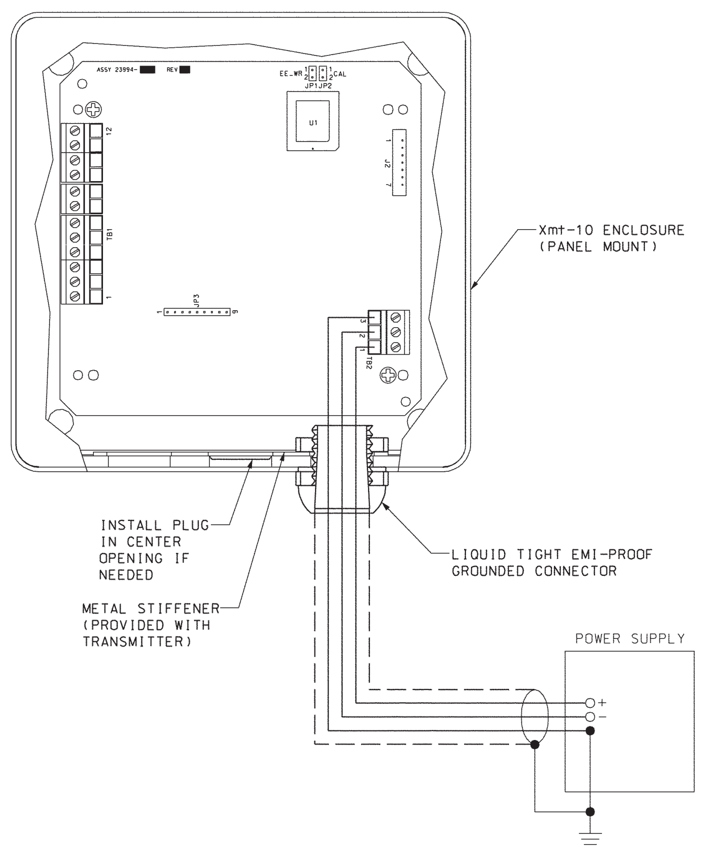


FIGURE 2-2. Power Supply/Current Loop Wiring

Panel Mounting.

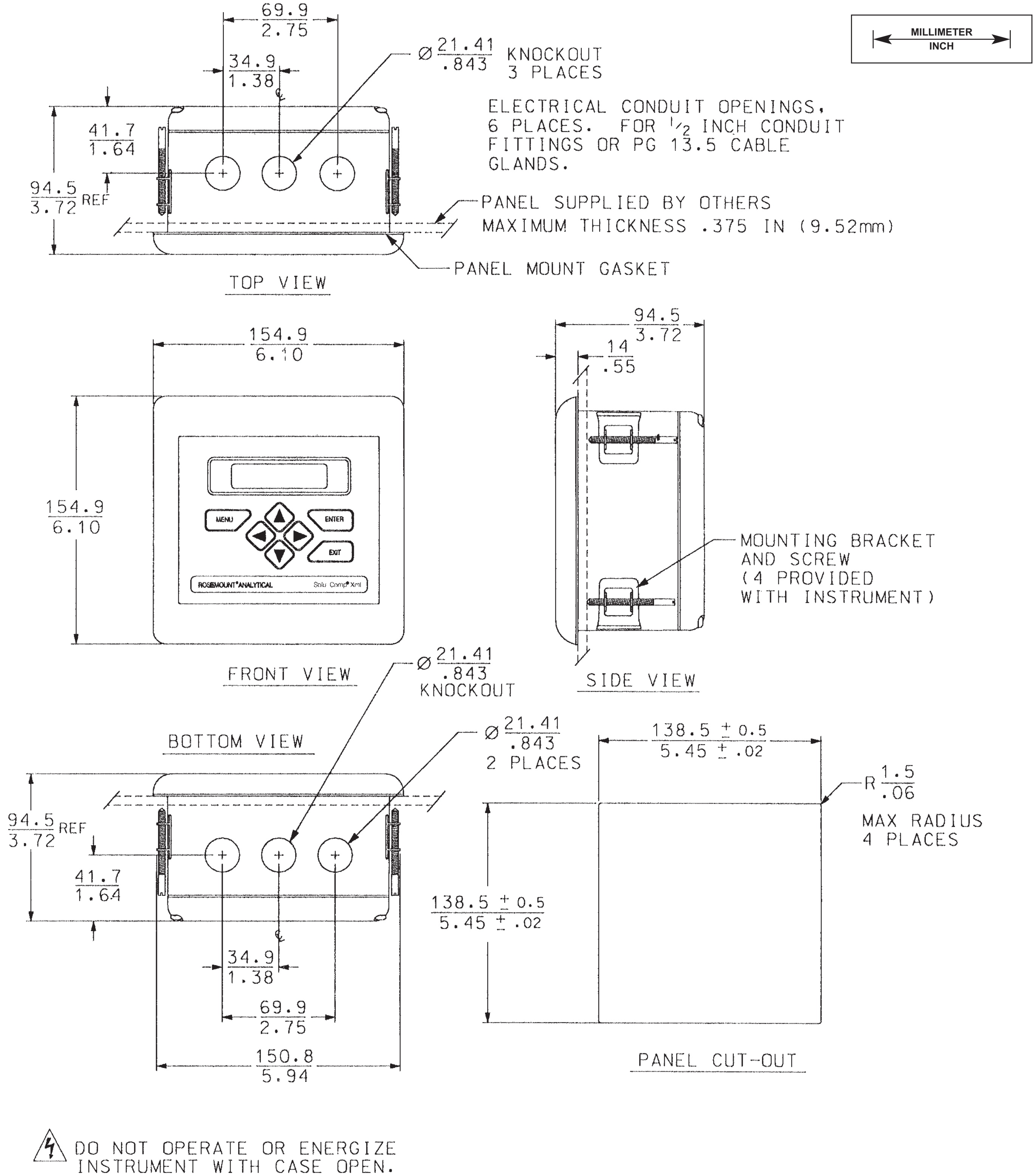


FIGURE 2-3. Panel Mount Installation

Access to the wiring terminals is through the rear cover. Four screws hold the cover in place.

Pipe Mounting.

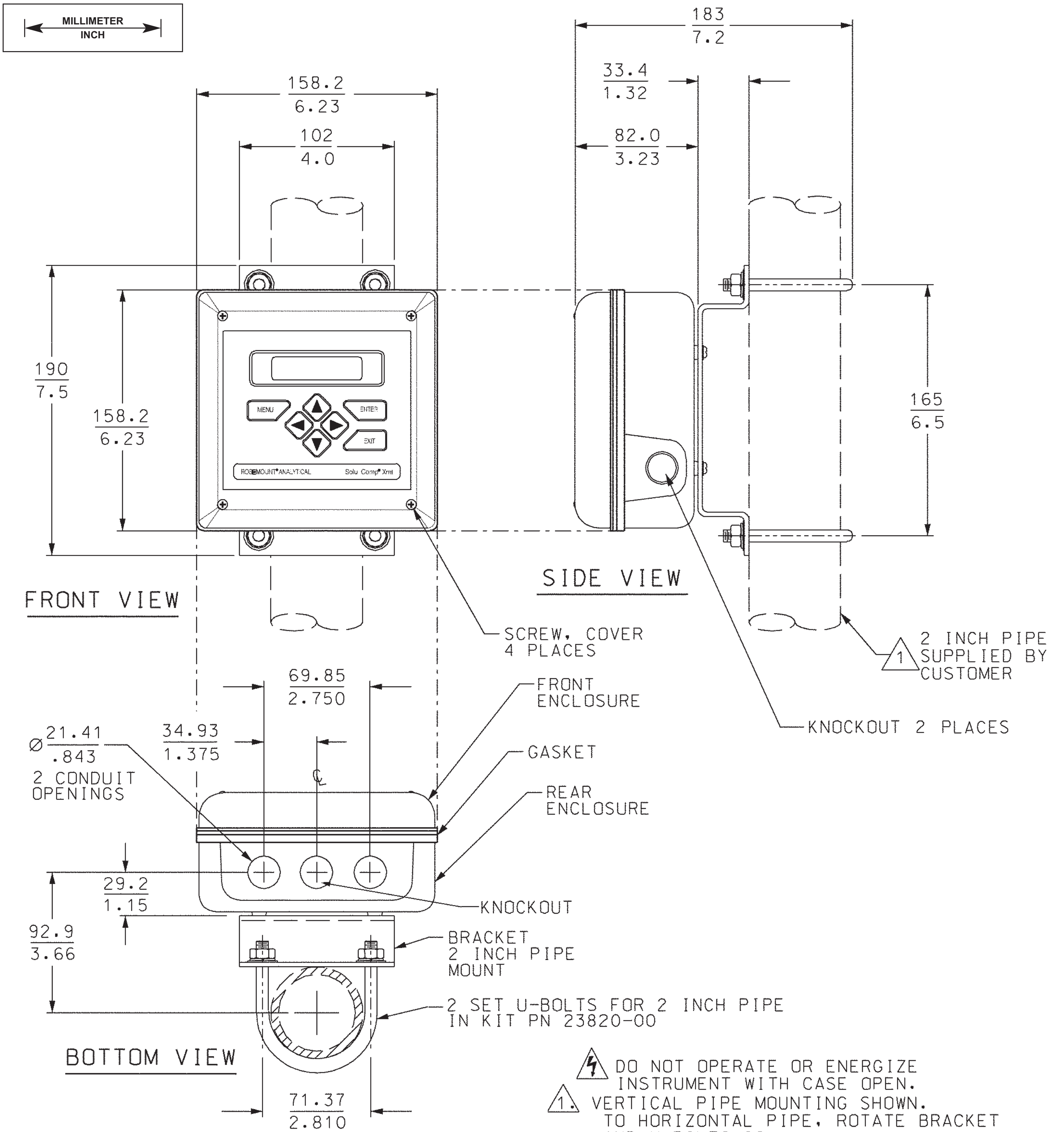


FIGURE 2-4. Pipe Mount Installation

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

Surface Mounting.

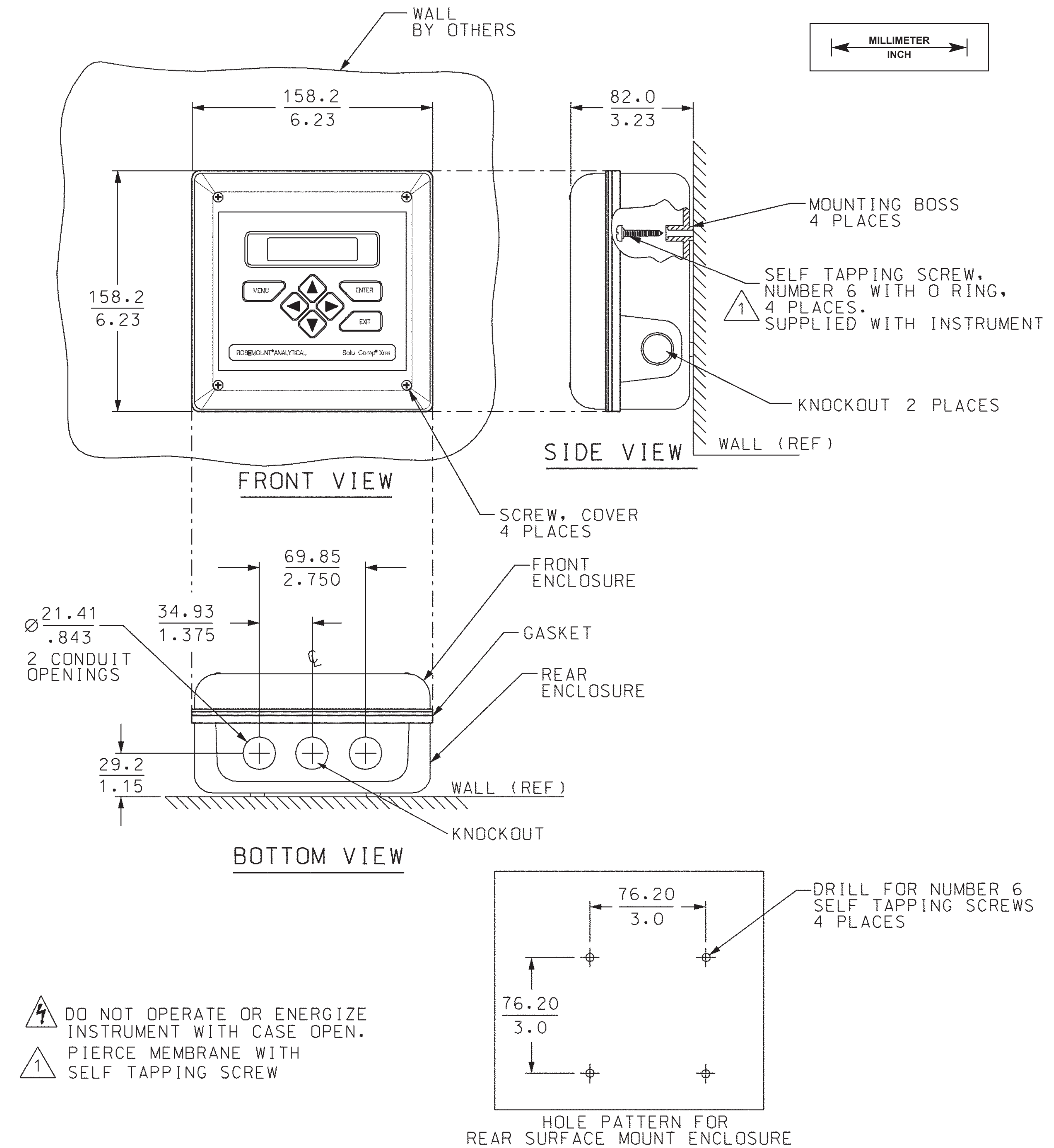


FIGURE 2-5. Surface Mount Installation

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

SECTION 3.0
WIRING

3.1 POWER SUPPLY/CURRENT LOOP — MODEL XMT-C-HT

3.1.1 Power Supply and Load Requirements.

Refer to Figure 3-1.

The supply voltage must be at least 12.0 Vdc at the transmitter terminals. The power supply must be able to cover the voltage drop on the cable as well as the load resistor (250 Ω minimum) required for HART communications. The maximum power supply voltage is 42.0 Vdc. For intrinsically safe installations, the maximum power supply voltage is 30.0 Vdc. The graph shows load and power supply requirements. The upper line is the power supply voltage needed to provide 12 Vdc at the transmitter terminals for a 22 mA current. The lower line is the power supply voltage needed to provide 30 Vdc for a 22 mA current.

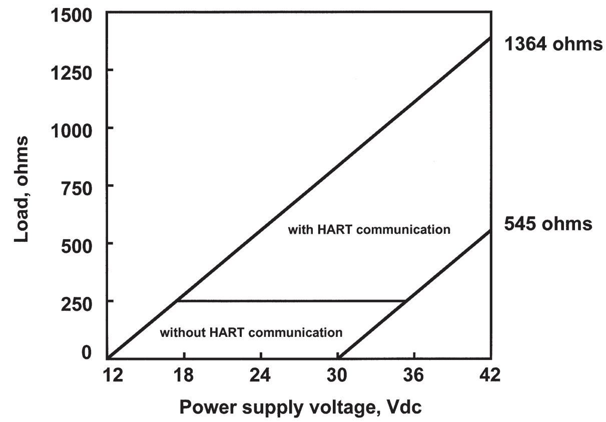


FIGURE 3-1. Load/Power Supply Requirements

The power supply must provide a surge current during the first 80 milliseconds of startup. The maximum current is about 24 mA.

For digital communications, the load must be at least 250 ohms. To supply the 12.0 Vdc lift off voltage at the transmitter, the power supply voltage must be at least 17.5 Vdc.

3.1.2 Power Supply-Current Loop Wiring.

For general purpose areas, wire power as shown in Figure 3-2. For hazardous areas, please see hazardous area installation drawings.

Run the power/signal wiring through the opening nearest TB-2.

For optimum EMI/RFI protection . . .

1. Use shielded power/signal cable and ground the shield at the power supply.
2. Use a metal cable gland and be sure the shield makes good electrical contact with the gland.
3. Use the metal backing plate when attaching the gland to transmitter enclosure.

The power/signal cable can also be enclosed in an earth-grounded metal conduit.

Do not run power supply/signal wiring in the same conduit or cable tray with AC power lines or with relay actuated signal cables. Keep power supply/signal wiring at least 6 ft (2 m) away from heavy electrical equipment.

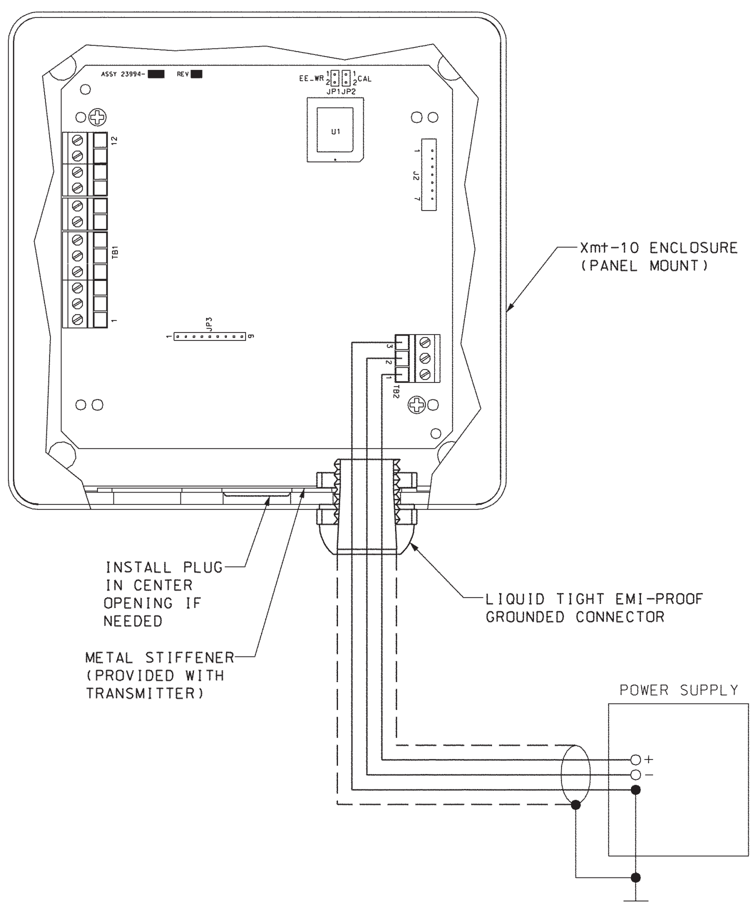


FIGURE3-2. Power Supply/Current Loop Wiring

3.2 POWER SUPPLY WIRING FOR MODEL XMT-C-FF

3.2.1 Power Supply Wiring. For general purpose areas, wire power as shown in Figure 3-4. For hazardous areas, please see hazardous area installation drawings. Refer to Figure 3-3 and Figure 3-4.

Run the power/signal wiring through the opening nearest TB2. Use shielded cable and ground the shield at the power supply. To ground the transmitter, attach the shield to TB2-3.

NOTE

For optimum EMI/RFI immunity, the power supply/output cable should be shielded and enclosed in an earth-grounded metal conduit.

Do not run power supply/signal wiring in the same conduit or cable tray with AC power lines or with relay actuated signal cables. Keep power supply/signal wiring at least 6 ft (2 m) away from heavy electrical equipment.

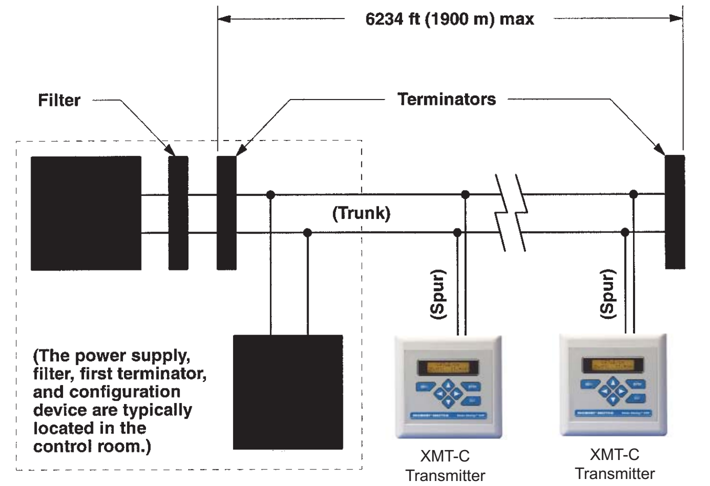


FIGURE 3-3. Typical Fieldbus Network Electrical Wiring Configuration

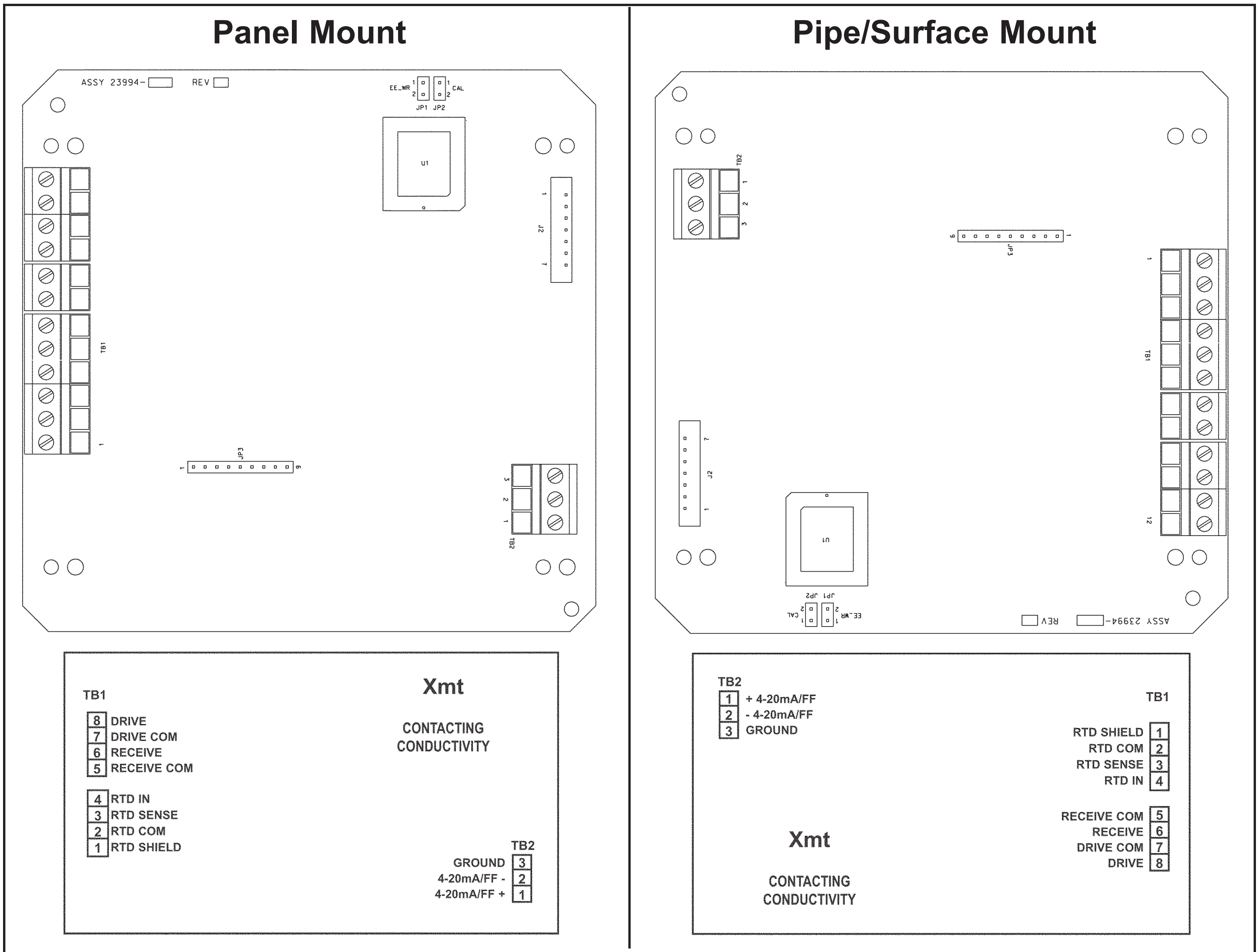


FIGURE 3-4. Loop Power and Sensor Wiring

3.3 SENSOR WIRING

Keep sensor wiring separate from power wiring. For best EMI/RFI protection, use shielded output signal cable in an earth-grounded metal conduit. See Figure 3-4. Refer to the Instruction Sheet provided with each sensor for specific wiring instructions.

3.1.1 WIRING THROUGH A JUNCTION BOX

The sensor can be wired to the analyzer through a remote junction box (PN 23550-00). Wire the extension cable and sensor cable point-to-point. See Figure 3-4. Refer to the sensor instruction manual for more details.

Factory-terminated (PN 23294-05) and unterminated (PN 9200276) connecting cable are available. The use of factory-terminated cable is strongly recommended. To prepare unterminated cable for use, follow the instructions in the sensor instruction manual.

For maximum EMI/RFI protection, the outer braid of the sensor cable should be connected to the outer braided shield of the extension cable. At the instrument, connect the outer braid of the extension cable to earth ground.

3.1.2 SENSOR SELECTION

All Rosemount Analytical contacting conductivity sensors with PT100 RTD or PT1000 RTD are compatible with the Model Xmt-C transmitter. Refer to the Instruction Sheet provided with each sensor for specific wiring instructions.

Choose a contacting conductivity sensor that is appropriate for your process conditions and range of conductivity measurement.

TABLE 3-1. Model Xmt-C Sensor Selection

Cell Constant	Range
0.01/cm	0 to 50 µS/cm
0.1/cm	1 to 500 µS/cm
1.0/cm	10 to 20,000 µS/cm

SECTION 4.0
INTRINSICALLY SAFE INSTALLATION

INTRINSICALLY SAFE INSTALLATIONS FOR MODEL XMT-C-HT

For FM Intrinsically Safe Label, see Figure 4-1.
For FM Intrinsically Safe Installation, see Figure 4-2.
For CSA Instrinsically Safe Label, see Figure 4-3.
For CSA Instrinsically Safe Installation, see Figure 4-4.
For ATEX Instrinsically Safe Label, see Figure 4-5.
For ATEX Instrinsically Safe Installation, see Figure 4-6.

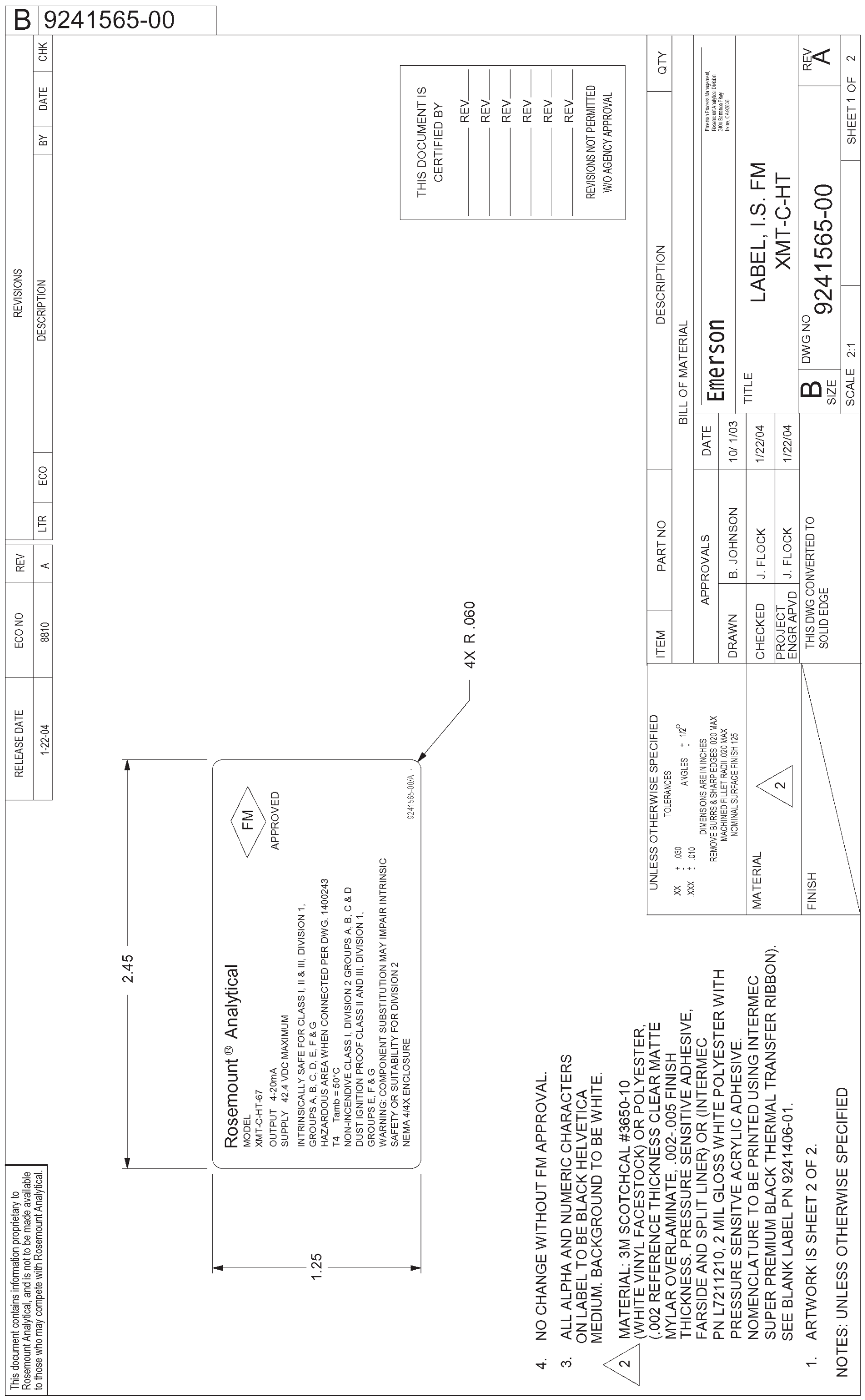
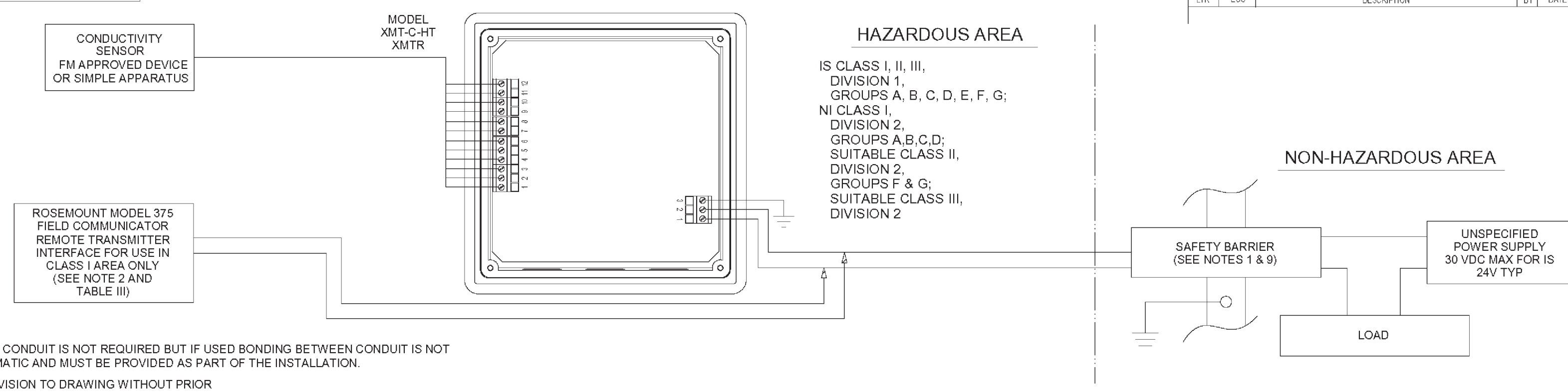


FIGURE 4-1. FM Intrinsically Safe Installation label

REVISION					
LTR	ECO	DESCRIPTION	BY	DATE	CHK

D 1400235



13. METAL CONDUIT IS NOT REQUIRED BUT IF USED BONDING BETWEEN CONDUIT IS NOT AUTOMATIC AND MUST BE PROVIDED AS PART OF THE INSTALLATION.

12. NO REVISION TO DRAWING WITHOUT PRIOR FM APPROVAL.

11. THE ASSOCIATED APPARATUS MUST BE FM APPROVED.

10. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc.

9. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

8. THE INTRINSICALLY SAFE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE DEVICES WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:

FIELD DEVICE INPUT		ASSOCIATED APPARATUS OUTPUT
Vmax OR Ui	≥	Voc, Vt OR Uo;
Imax OR Ii	≥	Isc, It OR Io;
Pmax OR Pi	≥	Po;
Ci+ Ccable;	≤	Ca, Ct OR Co
Li+ Lcable.	≤	La, Lt OR Lo

7. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 Ohm.

6. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

5. SENSORS SHALL MEET THE REQUIREMENTS OF SIMPLE APPARATUS AS DEFINED IN ANSI/ISA RP12.6 AND THE NEC, ANSI/NFPA 70. THEY CAN NOT GENERATE NOR STORE MORE THAN 1.5V, 100mA, 25mW OR A PASSIVE COMPONENT THAT DOES NOT DISSIPATE MORE THAN 1.3W.

4. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) SECTIONS 504 AND 505.

3. INTRINSICALLY SAFE APPARATUS (MODEL XMT-C-HT, IRC TRANSMITTER AND MODEL 375) AND ASSOCIATED APPARATUS (SAFETY BARRIER) SHALL MEET THE FOLLOWING REQUIREMENTS: THE VOLTAGE (Vmax) AND CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc OR Vt) AND CURRENT (Isc OR It) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS (SAFETY BARRIER). IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF THE INTRINSICALLY SAFE APPARATUS, INCLUDING INTERCONNECTING WIRING, MUST BE EQUAL OR LESS THAN THE CAPACITANCE (Ca) AND INDUCTANCE (La) WHICH CAN BE SAFELY CONNECTED TO THE APPARATUS. (REF. TABLES I, II AND III).

2. THE CAPACITANCE AND INDUCTANCE OF THE LOAD CONNECTED TO THE SENSOR TERMINALS MUST NOT EXCEED THE VALUES SPECIFIED IN TABLE I WHERE Ca ≥ Ci (SENSOR) + Ccable; La ≥ Li (SENSOR) + Lcable.

1. ANY SINGLE SHUNT ZENER DIODE SAFETY BARRIER APPROVED BY FM HAVING THE FOLLOWING OUTPUT PARAMETERS: SUPPLY/SIGNAL TERMINALS TB2-1, 2 AND 3.

Voc OR Vt NOT GREATER THAN 30 V
Isc OR It NOT GREATER THAN 200 mA
Pmax NOT GREATER THAN 0.9 W

NOTES: UNLESS OTHERWISE SPECIFIED

WARNING- SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY OR SUITABILITY FOR DIVISION 2.

WARNING- TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.

TABLE I

GAS GROUPS	OUTPUT PARAMETERS Ca (uF)	La (H)
A, B	13	800uH
C	240	3.30mH
D	240	6.0mH

TABLE II

OUTPUT PARAMETERS	MODEL XMT-C-HT TB1-1 THRU 12
Uo	7.2 V
Io	221 mA
Po	279.5 mW

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REV
REV
REV
REV
REV
REV
REVISIONS NOT PERMITTED W/O AGENCY APPROVAL

TABLE III

XMT-C-HT ENTITY PARAMETERS
SUPPLY / SIGNAL TERMINALS TB2-1, 2 AND 3

MODEL NO.	Vmax (Vdc)	Imax (mA)	Pmax (W)	Ci (nF)	Li (mH)
XMT-C-HT	30	200	0.9	0	0

ENTITY PARAMETERS: REMOTE TRANSMITTER INTERFACE

MODEL NO.	Vmax IN: Vdc	Imax IN:mA	Pamx IN: W	Ci (uF)	Li (mH)	Voc max OUT: Vdc	Isc max OUT:uA
375	30	200	1.0	0.0	0.0	1.9	32

UNLESS OTHERWISE SPECIFIED TOLERANCES .XX ± .030 .XXX ± .010 ANGLES ± 1/2° DIMENSIONS ARE IN INCHES REMOVE BURRS & SHARP EDGES .020 MAX MACHINED FILLET RADII .020 MAX NOMINAL SURFACE FINISH 125
MATERIAL
FINISH

ITEM	PART NO	DESCRIPTION	QTY

BILL OF MATERIAL

APPROVALS		DATE
DRAWN	B. JOHNSON	9/29/03
CHECKED	J. FLOCK	1/22/04
PROJECT ENGR APVD	J. FLOCK	1/22/04

THIS DWG CONVERTED TO SOLID EDGE

Uniloc — Rosemount Analytical, Uniloc Division, 2400 Barranca Pkwy, Irvine, CA 92606

TITLE SCHEMATIC, INSTALLATION MOD XMT-C-HT XMTR FM APPROVALS

SIZE D DWG NO. 1400243 REV A
SCALE NONE TYPE SHEET 1 OF 1

06-23-04		A
RELEASE DATE	ECO NO.	REV

FIGURE 4-2. FM Intrinsically Safe Installation Wiring

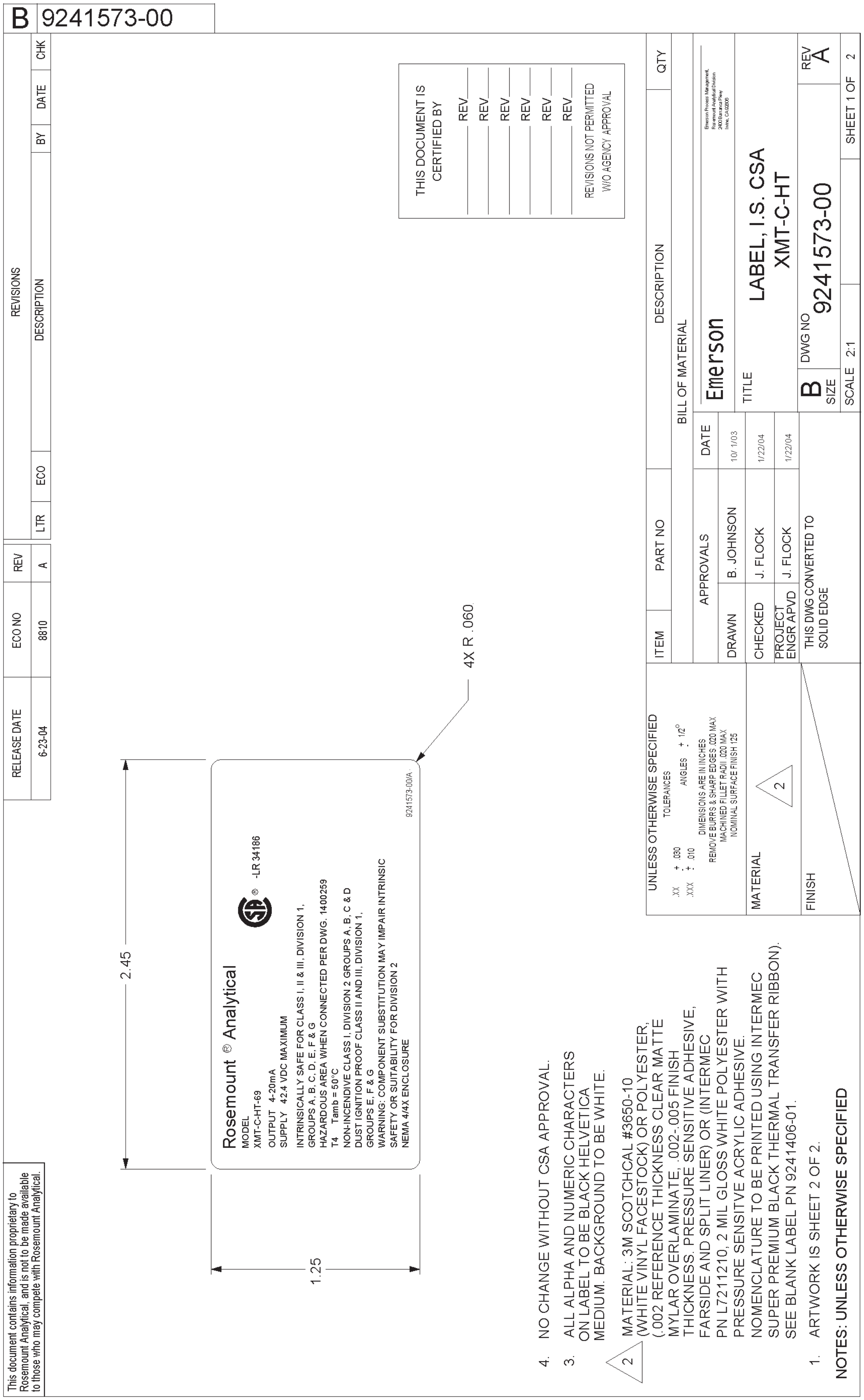
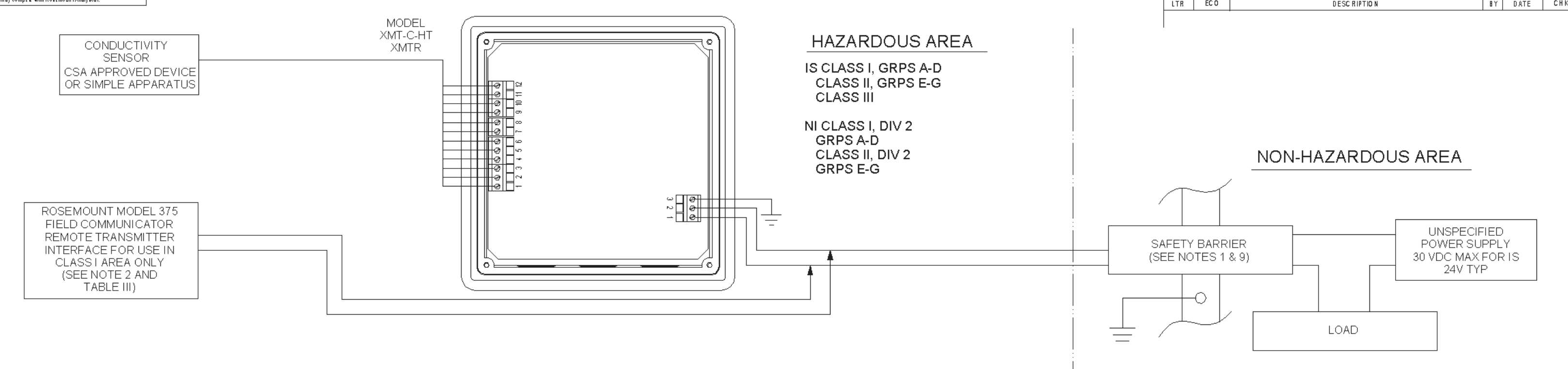


FIGURE 4-3. CSA Intrinsically Safe Installation Label



WARNING- SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY OR SUITABILITY FOR DIVISION 2.

WARNING- TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.

NOTES: UNLESS OTHERWISE SPECIFIED

1. ANY SINGLE SHUNT ZENER DIODE SAFETY BARRIER APPROVED BY CSA HAVING THE FOLLOWING OUTPUT PARAMETERS: SUPPLY/SIGNAL TERMINALS TB2-1, 2 AND 3.

   Voc OR Vt NOT GREATER THAN 30 V
   Isc OR It NOT GREATER THAN 200 mA
   Pmax NOT GREATER THAN 0.9 W

2. THE CAPACITANCE AND INDUCTANCE OF THE LOAD CONNECTED TO THE SENSOR TERMINALS MUST NOT EXCEED THE VALUES SPECIFIED IN TABLE I WHERE Ca ≥ Ci (SENSOR) + Ccable; La ≥ Li (SENSOR) + Lcable.

3. INTRINSICALLY SAFE APPARATUS (MODEL XMT-C-HT, IRC TRANSMITTER AND MODEL 375) AND ASSOCIATED APPARATUS (SAFETY BARRIER) SHALL MEET THE FOLLOWING REQUIREMENTS: THE VOLTAGE (Vmax) AND CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc OR Vt) AND CURRENT (Isc OR It) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS (SAFETY BARRIER). IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF THE INTRINSICALLY SAFE APPARATUS, INCLUDING INTERCONNECTING WIRING, MUST BE EQUAL OR LESS THAN THE CAPACITANCE (Ca) AND INDUCTANCE (La) WHICH CAN BE SAFELY CONNECTED TO THE APPARATUS. (REF. TABLES I, II AND III).

4. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE CANADIAN ELECTRICAL CODE, CSA C22.1, PART 1, APPENDIX F.

5. SENSORS SHALL MEET THE REQUIREMENTS OF SIMPLE APPARATUS AS DEFINED IN ANSI/ISA RP12.6 AND THE NEC, ANSI/NFPA 70. THEY CAN NOT GENERATE NOR STORE MORE THAN 1.5V, 100mA, 25mW OR A PASSIVE COMPONENT THAT DOES NOT DISSIPATE MORE THAN 1.3W.

6. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

7. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 Ohm.

8. THE INTRINSICALLY SAFE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE DEVICES WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:

FIELD DEVICE INPUT		ASSOCIATED APPARATUS OUTPUT
Vmax OR Ui	≥	Voc, Vt OR Uo;
Imax OR Ii	≥	Isc, It OR Io;
Pmax OR Pi	≥	Po;
Ci+ Ccable;	≤	Ca, Ct OR Co
Li+ Lcable.	≤	La, Lt OR Lo

9. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

10. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc.

11. THE ASSOCIATED APPARATUS MUST BE CSA APPROVED.

12. NO REVISION TO DRAWING WITHOUT PRIOR CSA APPROVAL.

TABLE I

GAS GROUPS	OUTPUT PARAMETERS	
	Ca (uF)	La (H)
A, B	13	800uH
C	240	330mH
D	240	6.0mH

TABLE II

OUTPUT PARAMETERS	MODEL XMT-C-HT TB1-1 THRU 12
Uo	7.2 V
Io	221 mA
Po	279.5 mW

TABLE III

XMT-C-HT ENTITY PARAMETERS
SUPPLY / SIGNAL TERMINALS TB2-1, 2 AND 3

MODEL NO.	Vmax (Vdc)	Imax (mA)	Pmax (W)	Ci (nF)	Li (mH)
XMT-C-HT	30	200	0.9	0	0

ENTITY PARAMETERS: REMOTE TRANSMITTER INTERFACE

MODEL NO.	Vmax IN: Vdc	Imax IN:mA	Pamx IN: W	Ci (uF)	Li (mH)	Voc max OUT: Vdc	Isc max OUT:uA
375	30	200	1.0	0.0	0.0	1.9	32

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REVISIONS NOT PERMITTED W/O AGENCY APPROVAL

APPROVALS		DATE
DRAWN	B. JOHNSON	9/29/03
CHECKED	J. FLOCK	01/22/04
PROJECT ENGR APVD	J. FLOCK	01/22/04

THIS DWG CONVERTED TO SOLID EDGE

Uniloc

TITLE: SCHEMATIC, INSTALLATION MOD XMT-C-HT XMTR CSA APPROVALS

SIZE D DWG NO. 1400259 REV A

RELEASE DATE 06-23-04 REV A

FIGURE 4-4. CSA Intrinsically Safe Installation Wiring

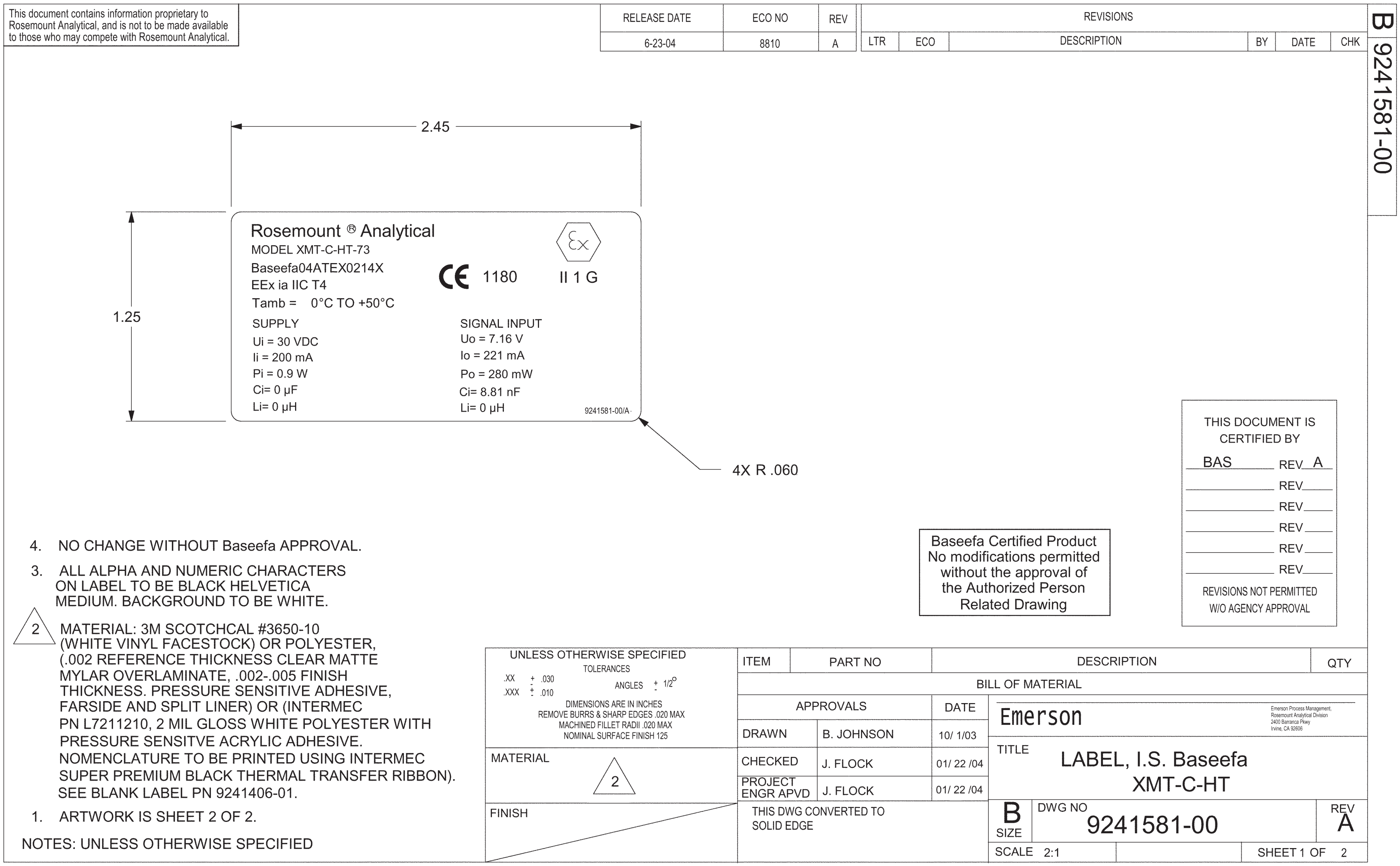


FIGURE 4-5. Baseefa/ATEX Intrinsically Safe Installation label

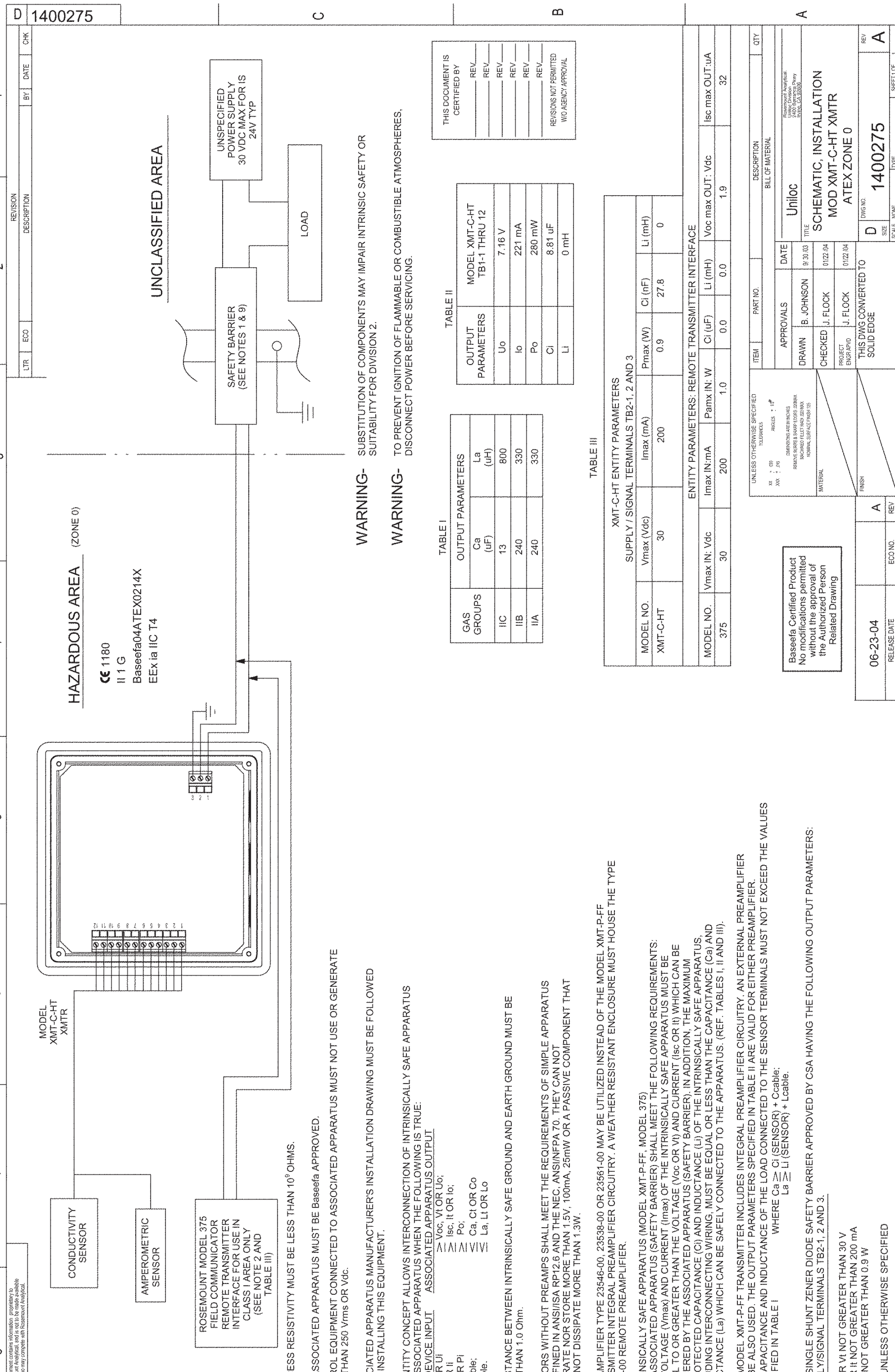


FIGURE 4-6. Baseefa/ATEX Intrinsically Safe Installation Wiring

SECTION 5.0
DISPLAY AND OPERATION

5.1. DISPLAY

The Model Xmt-C has a two-line display. Generally, the user can program the transmitter to show one of four displays. If the transmitter has been configured to measure total dissolved solids, resistivity, or percent conductivity, similar displays are available. Figure 5-1 shows the displays available for conductivity.

The transmitter has information screens that supplement the data in the main display. Press ▼ to view the information screens. The first information screen shows the type of measurement being made (conductivity, resistivity, TDS, custom). **The last information screen is the software version number.**

During calibration and programming, key presses cause different displays to appear. The displays are self-explanatory and guide the user step-by-step through the procedure.

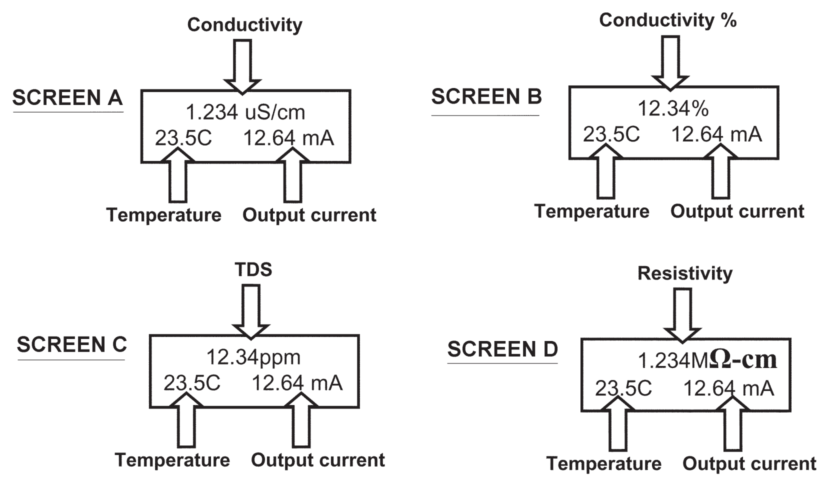


FIGURE 5-1. Displays During Normal Operation

Screen A shows the conductivity reading, the temperature, and the output current generated by the transmitter. Screen B shows the same information as Screen A except conductivity is shown as percent of scale. Screen C shows conductivity as parts per million total dissolved solids. Screen D displays conductivity as resistivity in mega-ohms per cm (MΩ-cm).

5.2 KEYPAD

Figure 5-2 shows the Solu Comp Xmt keypad.

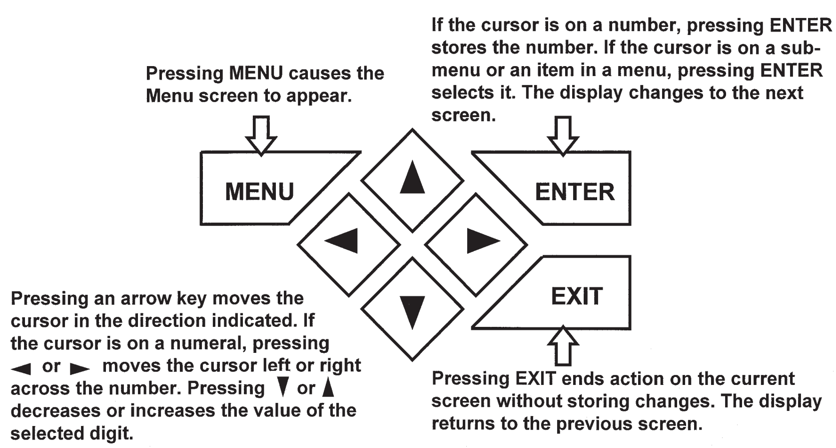


FIGURE 5-2. Solu Comp Xmt Keypad

Four arrow keys move the cursor around the screen. A blinking word or numeral show the position of the cursor. The arrow keys are also used to change the value of a numeral. Pressing ENTER stores numbers and settings and moves the display to the next screen. Pressing EXIT returns to the previous screen without storing changes. Pressing MENU always causes the main menu screen to appear. Pressing MENU followed by EXIT causes the main display to appear.

5.3 PROGRAMMING AND CALIBRATING THE MODEL XMT - TUTORIAL

Setting up and calibrating the Model Xmt is easy. The following tutorial describes how to move around in the programming menus. For practice, the tutorial also describes how to assign values to the 4 and 20 mA output.

```
Calibrate        Hold
Program       Display
```

1. If the menu screeen (shown at the left) is not already showing, press MENU. **Calibrate** is blinking, which means the cursor is on **Calibrate**.

```
Calibrate        Hold
Program       Display
```

2. To assign values to the current output, the **Program** sub-menu must be open. Press ▼. The cursor moves to **Program** (**Program** blinking.) Press ENTER. Pressing ENTER opens the **Program** sub-menu.

```
Output           Temp
Measurement        >>
```

```
Security         HART
ResetAnalyzer      >>
```

3. The **Program** sub-menu permits the user to configure and assign values to the 4-20 mA output, to test and trim the output, to change the type of measurement from what was selected during Quick Start, to set manual or automatic temperature correction for membrane permeability, and to set security codes. When the sub-menu opens, **Output** is blinking, which means the cursor is on **Output**. Press ▼ or ▶ (or any arrow key) to move the cursor around the display. Move the cursor to **>>** and press ENTER to cause a second screen with more program items to appear. There are three screens in the **Program** sub-menu. Pressing **>>** and ENTER in the third screen cause the display to return to the first screen (**Output**, **Temp**, **Measurement**).

4. For practice, assign values to the 4 and 20 mA output. Move the cursor to **Output** and press ENTER.

```
Output?          Test
Configure       Range
```

5. The screen shown at left appears. **Test** is blinking. Move the cursor to **Range** and press ENTER.

```
Output Range?
4mA       0.000µS/cm
```

6. The screen shown at left appears. + is blinking, which means the cursor is on +.
   a. To toggle between + and - press ▲ or ▼.
   b. To move from one digit to the next, press ◀ or ▶.
   c. To increase or decrease the value of a digit, press ▲ or ▼.
   d. To move the decimal point, press ◀ or ▶ until the cursor is on the decimal point. Press ▲ to move the decimal to the right. Press ▼ to move the decimal point to the left.
   e. Press ENTER to store the number.

```
Output Range?
20mA       2000µS/cm
```

7. The screen shown at left appears. Use this screen to assign a full scale value to the 20 mA output. Use the arrow keys to change the number to the desired value. Press ENTER to store the setting.

```
Output?          Test
Configure       Range
```

8. The screen shown at left appears. To configure the output or to test the output, move the cursor to the appropriate place and press ENTER.

9. To return to the main menu, press MENU. To return to the main display, press MENU then EXIT, or press EXIT repeatedly until the main display appears. To return to the previous display, press EXIT.

NOTE

To store values or settings, press ENTER before pressing EXIT.

5.4 MENU TREES

The Model Xmt-C-HT transmitter has four menus: CALIBRATE, PROGRAM, HOLD, and DISPLAY. Under the Calibrate and Program menus are several sub-menus. For example, under CALIBRATE, the sub-menus are **Conductivity** and **Temperature**. Under each sub-menu are prompts. Under PROGRAM, the sub-menus for Xmt-C-HT are **Output**, **Temp**, **Measurement**, **Security**, **HART**, and **Reset Analyzer**. The HOLD menu (HART only) enables or disables the 4-20 mA outputs. The DISPLAY menu allows the user to configure the main display information fields and to adjust the LCD display contrast. Figure 5-3 shows the complete menu tree for Model Xmt-C-HT. Figure 5-4 shows the complete menu tree for Model Xmt-C-FF.

5.5 DIAGNOSTIC MESSAGES

Whenever a warning or fault limit has been exceeded, the transmitter displays diagnostic messages to aid in troubleshooting. “Fault” or “Warn” appears in the main display to alert the user of an adverse condition. The display alternates between the regular display and the Fault or Warning message. If more than one warning or fault message has been generated, the messages appear alternately.

FIGURE 5-3. MENU TREE FOR MODEL SOLU COMP XMT-C-HT TRANSMITTER

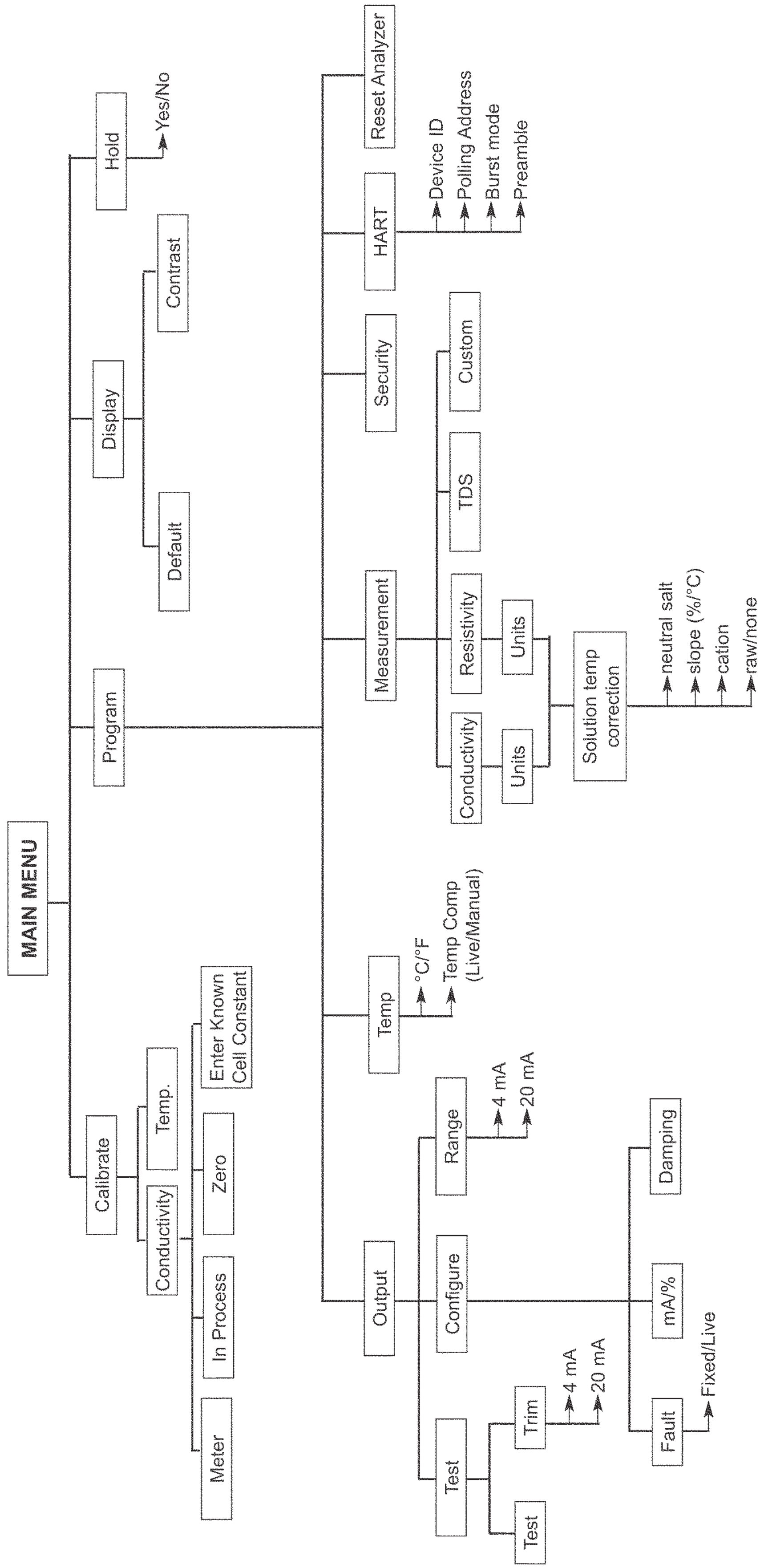
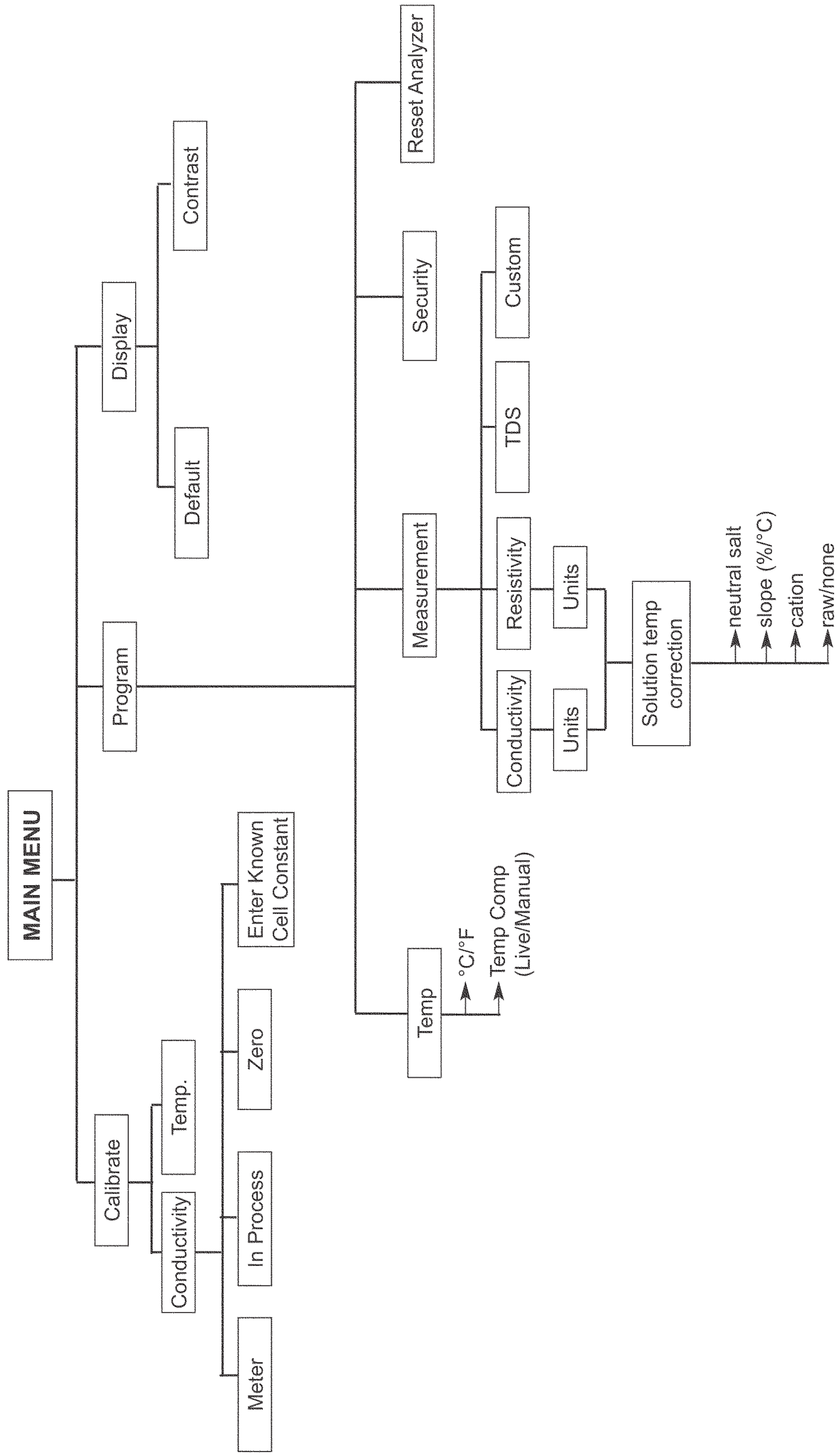


FIGURE 5-4. MENU TREE FOR MODEL SOLU COMP XMT-C-FF TRANSMITTER



5.6 SECURITY

5.6.1 How the Security Code Works

Use security codes to prevent accidental or unwanted changes to program settings, displays, and calibration. Two three-digit security codes can be used to do the following…

a. Allow a user to view the default display and information screens only.

b. Allow a user access to the calibration and hold menus only.

c. Allow a user access to all the menus.

```
Enter Security
Code:                000
```

1. If a security code has been programmed, pressing MENU causes the security screen to appear.
2. Enter the three-digit security code.
   a. If a security code has been assigned to ***configure*** only, entering it will unlock all the menus.
   b. If separate security codes have been assigned to ***calibrate*** and ***configure***, entering the calibrate code will allow the user access to only the calibrate and hold menus; entering the configuration code will allow the user access to all menus.

```
     Invalid Code
```

3. If the entered code is correct, the main menu screen appears. If the code is incorrect, the **Invalid Code** screen appears. The **Enter Security Code** screen reappears after two seconds.

5.6.2 Bypassing the Security Code

Enter 555. The main menu will open.

5.6.3 Setting a Security Code

See Section 7.6.

5.7 USING HOLD (HART version only)

5.7.1 Purpose

The transmitter output is always proportional to the process variable (conductivity or resistivity). To prevent improper operation of control systems or dosing pumps, place the transmitter in hold before removing the sensor for maintenance. Be sure to remove the transmitter from hold once the work is complete and the sensor has been returned to the process liquid. During hold the transmitter current goes to the value programmed by the user. Once in hold, the transmitter remains there indefinitely. While in hold, the word "hold" appears periodically in the display.

5.7.2 Using the Hold Function

```
Calibrate           Hold
Program          Display
```

1. Press MENU. The main menu screen appears. Choose **Hold**.

```
Hold Outputs?
Yes                   No
```

2. The **Hold Output** screen appears. Choose **Yes** to put the transmitter in hold.

```
Live             10.00mA
Hold at          21.00mA
```

3. The top line in the display is the present current output. Use the arrow keys to change the number in the second line to the desired current during hold.
4. The main display screen appears.
5. To take the transmitter out of hole, repeat steps 1 and 2 and choose **No** in step 2.

SECTION 6.0
OPERATION WITH MODEL 375

6.1 Note on Model 375 HART and Foundation Fieldbus Communicator

The Model 375 HART Communicator is a product of Emerson Process Management, Rosemount Inc. This section contains selected information on using the Model 375 with the Rosemount Analytical Model XMT-C-HT Transmitter and Model XMT-C-FF Transmitter. For complete information on the Model 375 Communicator, see the Model 375 instruction manual. For technical support on the Model 375 Communicator, call Rosemount Inc. at (800) 999-9307 within the United States. Support is available worldwide on the internet at *http://rosemount.com*.

6.2 Connecting the HART and Foundation Fieldbus Communicator

Figure 6-1 shows how the Model 275 or 375 Communicator connects to the output lines from the Model XMT-C Transmitter.

CAUTION

For intrinsically safe CSA and FM wiring connections, see the Model 375 instruction manual.

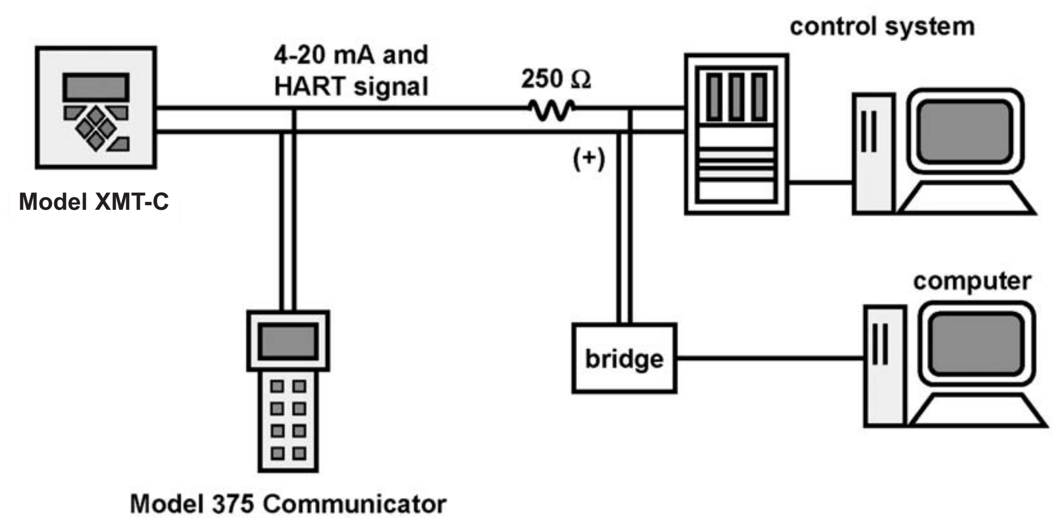


FIGURE 6-1. Connecting the Model 375 Communicator

6.3 Operation

6.3.1 Off-line and On-line Operation

The Model 375 Communicator features off-line and on-line communications. On-line means the communicator is connected to the transmitter in the usual fashion. While the communicator is on line, the operator can view measurement data, change program settings, and read diagnostic messages. Off-line means the communicator is not connected to the transmitter. When the communicator is off line, the operator can still program settings into the communicator. Later, after the communicator has been connected to a transmitter, the operator can transfer the programmed settings to the transmitter. Off-line operation permits settings common to several transmitters to be easily stored in all of them.

6.3.2 Making HART related settings from the keypad

Calibrate	Hold
Program	Display

1. Press MENU. The main menu screen appears. Choose **Program**.

Output	Temp
Measurement	**>>**

2. Choose **>>**.

Security	**HART**
	>>

3. Choose **HART**.

DevID	PollAddrs
Burst	Preamble

4. To display the device ID, choose **DevID**. To change the polling address, choose **PollAddrs**. To make burst mode settings, choose **Burst**. To change the preamble count, choose **Preamble**.

6.3.3 Menu Tree

The menu tree for the Model 275 and Model 375 HART communicators are on the following pages.

FIGURE 6-2. XMT-C-HT HART/Model 375 Menu Tree (1 of 3)

- Device setup
  - Process variables
    - Cond *
    - Raw
    - Conductance
    - Temp
    - Temp res
    - View status
  - Diag/Service
    - Test device
      - Loop test
      - View status
      - Master reset
      - Fault history
    - Hold mode
    - Calibration
      - Calibrate sensor
      - Zero in air
      - Zero in solution **
      - Adjust temperature
      - Calibrate input *...
      - Cell constant
      - Temp slope ***
    - D/A trim
    - Diagnostic vars
      - Cond *
      - Temp
      - Cell constant
      - Zero offset
      - Soln offset **
      - Temp slope ***
      - Input cal factor
  - Basic setup
    - Tag
    - PV range values
      - PV LRV
      - PV URV
      - PV
      - PV % rnge
    - Device information
      - Distributor
      - Model
      - Dev id
      - Tag
      - Date
      - Physicl signl code
      - Write protect
      - Snsr text
      - Descriptor
      - Message
      - Revision #'s
        - Universal rev
        - Fld dev rev
        - Software rev
        - Hardware rev

FIGURE 6-2. XMT-C-HT HART/Model 375 Menu Tree (2 of 3)

Detailed setup
  Sensors
    Main sensor
      PV Type [Conductivity, Resistivity, 0-12% NaOH, 0-15% HCl, 0-25% H2SO4, 96-99.7% H2SO4, 0-20% NaCl, TDS, Custom]
      PV Snsr unit [uS/cm, uS/m, mS/cm, mS/m, Mohm-cm, %, ppm, _]
      Cond unit [uS/cm, uS/m, mS/cm, mS/m] ****
      Define curve ****
      View custom points ****
      Cell constant
      Temp comp type [Linear, Neutral salt, Cation, None/Off] *..
      Temp slope ***
      Ref temp *** AND *. , ****
      PV sensor type
      Sensor information
        LSL
        USL
        Min span
    Temperature
      ATC [On, Off]
      Man temp
      Temp unit [ºC, ºF]
      Temp snsr [RTD PT100, RTD PT1000, Manual]
    Diag override
      PV>display limit [ON, OFF]
      EE write Error [ON, OFF]
      EE chksum Error [ON, OFF]
      EE buf overflow [ON, OFF]
      % out of range [ON, OFF]
      Need zero cal [ON, OFF]
      Temperature high [ON, OFF]
      Temperature low [ON, OFF]
      Sense line open [ON, OFF]
      Need factory cal [ON, OFF]
      Input Overrange [ON, OFF]
      A2D Read Error [ON, OFF]
      RTDohm overrange [ON, OFF]
      RTD open [ON, OFF]

  Signal condition
    LRV
    URV
    AO Damp
    % rnge
    Xfer fnctn
    AO1 lo end point
    AO1 hi end pt
  Output condition
    Analog output
      AO1
      AO Alrm typ
      Fixed
      Fault mode [Fixed, Live]
      Fault
      Loop test
      D/A trim

FIGURE 6-2. XMT-C-HT HART/Model 375 Menu Tree (3 of 3)

```
          HART output
             PV is Process
             SV is Temperature
             TV is Raw process
             Poll addr
             Burst option [PV, %range/current, Process vars/crnt]
             Burst mode [Off, On]
             Num req preams
             Num resp preams
       Device information
          Distributor
          Model
          Dev id
          Tag
          Date
          Physicl signl code
          Write protect
          Snsr text
          Descriptor
          Message
          Revision #'s
             Universal rev
             Fld dev rev
             Software rev
             Hardware rev
       Local Display
          AO LOI units [mA, %]
          LOI cfg code
          LOI cal code
       Load Default Conf.
    Review
PV
PV AO
PV LRV
PV URV
------------------------------------------------------------------------------

Notes:
*      Can be Cond, Res, NaOH, HCl, H2SO4, NaCl, TDS or Custom
**     Valid only when PV Type = NaOH, HCl, 0-25% H2SO4, or NaCl
***    Valid only when Temp comp type = Linear
****   Valid only when PV Type = Custom
*.     Valid only when PV Sensor Type = Toroidal
*..    Valid only when PV Type = Conductivity or Resistivity. For contacting sensors,
                 the item list is [Linear, Neutral salt, Cation, None/off].
                   For toroidal sensors, the item list is [Linear, None/off].
*...   Valid only when PV Sensor Type = Contacting


/* Xmt CT done */
```

SECTION 7.0
CALIBRATION — TEMPERATURE

7.1 INTRODUCTION

The Calibrate Menu allows the user to calibrate the conductivity readings and temperature response of the sensor.

7.2 CALIBRATING TEMPERATURE

7.2.1 Purpose

This procedure is used to ensure an accurate temperature measurement by the temperature sensor. It enables the instrument to display process temperature accurately as well as to compensate for the effect of temperature on the conductivity reading when the temperature in your process changes. The following steps should be performed with the sensor in the process or in a grab sample near the operating temperature of the process.

7.2.2 Procedure

1. Check the instrument temperature reading (main display) to make sure the sensor has acclimated to the process temperature. Compare the instrument temperature to a calibrated temperature reading device. Proceed to the next step if the reading requires adjustment.

```
Calibrate        Hold
Program       Display
```

2. Press MENU. The menu screen appears. Choose **Calibrate**.

```
Cal?     Conductivity
          Temperature
```

3. Choose **Temperature**.

```
Live           25.0°C
Cal          +025.0°C
```

4. To calibrate the temperature, change the number in the second line to match the temperature measured **in the process**. Press ENTER.

5. Press MENU then EXIT to return to the main display.

SECTION 8.0
CALIBRATION — CONDUCTIVITY

The following procedures are described in this section:

- Entering the cell constant (Section 8.1)
- Zeroing the transmitter (Section 8.2)
- Calibrating the sensor in a Conductivity Standard (Section 8.3)
- Calibrating the sensor to a Conductivity Meter (Section 8.4)
- Entering the temperature slope (Section 8.5)

INTRODUCTION

Calibration is the process of adjusting or standardizing the transmitter to a lab test (such as free acid titration) or a calibrated laboratory instrument, or standardizing to some known reference (such as a commercial chemical standard). Calibration ensures that the transmitter reads an accurate, and therefore, repeatable reading of conductivity and temperature. This section contains procedures for the first time use and for routine calibration of the Model Xmt-C transmitter.

Since conductivity measurements are affected by temperature, the Model Xmt-C reads the temperature at the probe and compensates for the changing temperature by referencing all conductivity measurements to 25°C (77°F).

To ensure the transmitter's accuracy, it is important to perform all the calibration procedures provided in this section if you are:

- installing this unit for the first time
- changing or replacing a probe
- troubleshooting

After the initial calibration, the accuracy of the conductivity reading should be checked periodically against some known standard of conductivity and temperature.

Entering the cell constant, zeroing the instrument, and calibrating the sensor should be done when first commissioning the Xmt and when changing the conductivity probe. These operations should be conducted with the conductivity probe wired to the transmitter with full length of extension cable (if any) for best results.

8.1 ENTERING THE CELL CONSTANT

The cell constant should be entered:

- When the unit is installed for the first time
- When the probe is replaced
- During troubleshooting

All cell constants can be located on the cable label of the conductivity probe.

```
Cal?          Conductivity
               Temperature
```

1. Press MENU. The main menu appears. Choose **Calibrate**. Press ENTER.

```
Cal?             InProcess
Meter      Zero         >>
```

2. Choose **Conductivity**. The screen at the left will appear. Press ENTER.

```
Enter Cell Const
Temp Slope              >>
```

3. Scroll right with the right arrow key. The screen at the left will appear.

```
Cell Constant?
                 1.0000/cm
```

4. Choose **Enter Cell Constant**. The screen at the left will appear.

5. Enter the actual cell constant as printed on the sensor tag attached to the sensor cable.

NOTE

For sensors that show a "cal constant" on the label, the actual cell constant can be calculated by adding 500 to the cal constant, multiply this value by the nominal cell constant, then divide the result by 1000.

If there is no cell constant on the label, calculate it from the equation:

$$\text{cell const} = K\left(\frac{500 + \text{cal const}}{1000}\right)$$

6. Press ENTER. All conductivity readings will reference this sensor-specific cell constant.

7. Press EXIT once.

NOTE

The cell constant you have entered is changed after the Standardizing Conductivity procedure is performed. **For inductive sensors and contacting sensors that only show nominal cell constants, do not change it back to the value as shown on the probe label.**

8.2 ZEROING THE INSTRUMENT

This procedure is used to compensate for small offsets to the conductivity signal that are present even when there is no conductivity to be measured. This procedure is affected by the length of extension cable and should always be repeated if any changes in extension cable or sensor have been made. **Electrically connect the conductivity probe as it will actually be used and place the measuring portion of the probe in air.**

Complete the following procedure. **Verify that the sensor is actually in air.** If the displayed value is not very close to zero, then press ENTER. The transmitter will establish a new zero.

```
Calibrate          Hold
Program         Display
```

1. If continuing from the previous procedure, the screen on the left will appear.

```
Cal?       Conductivity
            Temperature
```

2. Choose **Conductivity**. Press ENTER.

```
Ca?           InProcess
Meter     Zero       >>
```

```
Live            1.000µS
Zeroing            Wait
```

```
Live            0.000µS
Sensor Zero Done
```

3. Choose **Zero**. Press ENTER. The screens at the left will appear briefly during zeroing.

   After a few seconds, the display will return to a value of 0 µS/cm and may then change slightly. A slight variation from zero is to be expected, and the procedure may be repeated several times, if necessary. A successful zero is indicated with a message of "Sensor Zero Done".

   An unsuccessful zero will result if the conductivity reading is more than 1000 µS/cm or if the reading is too unstable. The "Zero offset error" message indicates the reading is too high for the zero routine. If repeated attempts do not result in an acceptable zero, there is a good chance that there is a wiring problem.

4. After electronic zeroing, the Conductivity menu screen will appear.

8.3 CALIBRATING THE SENSOR IN A CONDUCTIVITY STANDARD

This procedure is used to check and correct the conductivity reading of the Model Xmt-C to ensure that the reading is accurate. This is done by submerging the probe in the sample of known conductivity, then adjusting the displayed value, if necessary, to correspond to the conductivity value of the sample.

This procedure must always be done after cleaning the probe. The temperature reading must also be checked and standardized if necessary, prior to performing this procedure.

Important: If you are submerging the probe in the commercial conductivity standard solution, follow steps 1 through 3 below. If you are leaving the probe submerged in a chemical solution bath and checking conductivity against a laboratory instrument, complete the meter cal procedure in Section 8.4.

1. Be sure that the probe has been cleaned of heavy deposits of dirt, oils, or chemical residue.
2. Commercial standards are referenced to a known temperature, for example, 4000 micromhos at 25°C (77°F). As the temperature of the standard changes, the conductivity will change. Therefore it is recommended that this procedure be performed at a temperature between 22 and 28 °C. **Be sure the probe has reached a stable temperature before standardizing.**
3. Pour the standard into a clean container. Submerge the clean probe in the standard. Place the probe so that a minimum of 1 in. of liquid surrounds the probe. Do not allow the probe to be closer than 1 in. to the sides or bottom of the container. Shake the probe slightly to eliminate any trapped air bubbles. Observe the displayed conductivity to determine if the sensor needs to be moved.

Alternatively, the probe can be calibrated while inserted in the process. This is done by adjusting the Model Xmt-C conductivity reading to the known conductivity of the process water which is close to the probe to be calibrated.

```
Live          10.00µS/cm
Cal           10.00µS/cm
```

a. Choose **In Process**. Press ENTER. The screen at the left will appear.

```
Cal in progress.
Please wait.
```

```
Updated    Cell
Const:   1.0013/cm
```

b. Using the arrow keys, enter the actual conductivity of the conductivity standard in µS/cm. Press ENTER. The screens at the left will appear during this standardization process.

   The conductivity reading in the display will change to the new value and the cell constant or cell factor will be recalculated. The cell factor can be viewed in the information screens.

   If too large an adjustment is attempted, the transmitter will display "calibration error" and no change will be made.

8.4 CALIBRATING THE SENSOR TO A LABORATORY INSTRUMENT

This procedure is used to check the and correct the conductivity reading of the Model Xmt-C using a laboratory conductivity instrument. This is done by submerging the conductivity probe in a bath and measuring the conductivity of a grab sample of the same bath water with a separate laboratory instrument. The Model Xmt-C reading is then adjusted to match the conductivity reading of the lab instrument.

```
Use precision
resistors only
```

```
Live          50.00kΩ
Input         50.00kΩ
```

1. Choose **Meter**. Press ENTER. The screens at the left will appear.

2. Take a grab sample that is as close to the sensor as possible.

3. Using a calibrated laboratory instrument **with automatic temperature compensation,** determine the conductivity of the process or grab sample (as close to actual process temperature as possible). Continue with the following step if an adjustment is needed.

```
Cal in progress.
Please wait.
```

4. Using the arrow keys, enter the conductivity that appears on the laboratory instrument. Press ENTER. The screens at the left will appear during this standardization process.

8.5 CALIBRATING TEMPERATURE SLOPE

Conductivity is temperature-compensated per a constant linear slope of 0-5%/°C. The temperature slope currently being used by the transmitter is displayed. If this value is acceptable, press EXIT. 2%/°C is a good value for natural waters. To change the temperature slope, complete the following procedure.

```
Cal?        InProcess
Meter     Zero     >>
```

1. If continuing from the previous steps, the screen on the left will appear.

```
Enter Cell Const
Temp Slope         >>
```

2. Scroll right until the screen at the left appears. Choose **Temp Slope**. Press ENTER.

```
Temperature
Slope?        2.00%/ C
```

3. Enter the percent change of conductivity (µS/cm) per degrees Centigrade. Press ENTER. All conductivity readings will be temperature compensated according to the linear slope constant that you have manually entered.

SECTION 9.0
PROGRAMMING THE TRANSMITTER

9.1 GENERAL

This section describes how to program the transmitter using the keypad.

1. Configure and assign values to the 4-20 mA output [-HT version only] (Section 9.3)
2. Test and trim the current output [-HT version only] (Section 9.3)
3. Select the measurement to be made [conductivity, resistivity, or TDS] (Section 9.4)
4. Choose temperature units and automatic or manual temperature mode (Section 9.5)
5. Set a security code (Section 9.6)
6. Resetting factory default settings (Section 9.8)
7. Selecting a default display screen and adjusting screen constrast (Section 9.9)

9.2 CHANGING START-UP SETTINGS

When the Solu Comp Xmt is powered up for the first time, startup screens appear. The screens prompt the user to enter the measurement being made, to enter the cell constant, and to select temperature units. If incorrect settings were entered at startup, enter the correct settings now. To change the measurement, refer to Section 9.4.

9.3 CONFIGURING AND RANGING THE OUTPUT (-HT version only)

9.3.1 Purpose

1. Configuring an output means
   a. displaying the output reading in units of mA or percent of full scale.
   b. changing the time constant for output dampening.
   c. assigning the value the output current will take if the transmitter detects a fault in itself or the sensor.
2. Ranging the output means assigning values to the 4 mA and 20 mA outputs.
3. Testing an output means entering a test value from the keypad to check the operation of recorders or transmitters.
4. Trimming an output means calibrating the 4 and 20 mA current outputs against a referee milliammeter.

9.3.2 Definitions

1. CURRENT OUTPUT. The transmitter provides a continuous 4-20 mA output current directly proportional to the pH of the sample.
2. FAULT. The transmitter continuously monitors itself and the sensor for faults. If the transmitter detects a fault, the 4-20 mA output can be programmed to go to a fixed value or it can be programmed to continue to display the live current reading. In any event Fault appears intermittently in the second line of the display.
3. DAMPEN. Output dampening smooths out noisy readings. But it also increases the response time of the output. To estimate the time (in minutes) required for the output to reach 95% of the final reading following a step change, divide the setting by 20. Thus, a setting of 140 means that, following a step change, the output takes about seven minutes to reach 95% of final reading. The output dampen setting does not affect the response time of the process display. The maximum setting is 255.
4. TEST. The transmitter can be programmed to generate a test current.

9.3.3 Procedure: Configuring the Output

```
Calibrate        Hold
Program       Display
```

1. Press MENU. The menu screen appears. Choose **Program**.

```
Output           Temp
Measurement        >>
```

2. Choose **Output**.

```
Output?          Test
Configure       Range
```

3. Choose **Configure**.

```
Configure?      Fault
mA/%          Damping
```

4. Choose **Fault**.

```
Set to value?
Fixed            Live
```

5. Choose **Fixed** or **Live**.

```
Current Output
if Fault:22.00mA
```

6. If you chose **Fixed**, the screen at left appears. Use the arrow keys to change the fault current to the desired value. The limits are 4.00 to 22.00 mA. If you chose **Live**, there are no settings to make.

```
Configure?      Fault
mA/%          Damping
```

7. The screen at left appears. Choose **mA/%**.

```
Display Ouput?
mA            percent
```

8. Choose **mA** or **percent**. Percent means the display will show percent of full scale reading.

```
Configure?      Fault
mA/%          Damping
```

9. The screen at left appears. Choose **Damping**.

```
Damping?      000 255
              000 sec
```

10. Use the arrow keys to change the blinking display to the desired time constant.

7.3.4 Procedure: Ranging the output

```
Calibrate        Hold
Program       Display
```

1. From the main display, press MENU. The menu screen appears. Choose **Program**.

```
Output           Temp
Measurement        >>
```

2. Choose **Output**.

```
Output?          Test
Configure       Range
```

3. Choose **Range**.

```
Output range?
4mA       0.000µS/cm
```

4. Assign a value to the 4 mA output and press ENTER. Then assign a value to the 20 mA output. Press ENTER. Use the arrow keys to change the flashing display to the desired value.

9.3.5 Procedure: Testing the output

```
Calibrate          Hold
Program         Display
```

1. From the main display, press MENU. The menu screen appears. Choose **Program**.

```
Output             Temp
Measurement          >>
```

2. Choose **Output**.

```
Output?            Test
Configure         Range
```

3. Choose **Test**.

```
Test Output
Trim Output
```

4. Choose **Test Output**.

```
Current Output
for Test:12.00mA
```

5. Use the arrow keys to change the displayed current to the desired value. Press ENTER. The output will change to the value just entered.

6. To return to normal operation, press EXIT. The output will return to the value determined by the process variable.

7. To return to the main display, press MENU then EXIT.

9.3.6 Procedure: Trimming the output

1. Connect an accurate milliammeter in series with the current output.

```
Calibrate          Hold
Program         Display
```

2. Press MENU. The menu screen appears. Choose **Program**.

```
Output             Temp
Measurement          >>
```

3. Choose **Output**.

```
Output?            Test
Configure         Range
```

4. Choose **Test**.

```
Test Output
Trim Output
```

5. Choose **Trim Output**.

```
Meter reading:
                04.00mA
```

6. The output goes to 4.00 mA. If the milliammeter does not read 4.00 mA, use the arrow keys to change the display to match the current measured by the milliammeter. Press ENTER.

```
Meter reading:
                20.00mA
```

7. The output goes to 20.00 mA. If the milliammeter does not read 20.00 mA, use the arrow keys to change the display to match the current measured by the milliammeter. Press ENTER.

```
Trim Complete
```

8. To return to the main display, press MENU then EXIT.

9.4 CHOOSING AND CONFIGURING THE ANALYTICAL MEASUREMENT

9.4.1 Purpose

This section describes how to do the following:

1. Configure the transmitter to measure conductivity, resistivity, or TDS.
2. If resistivity was selected, one of the following temperature corrections must be selected:
   a. Neutral salt
   b. Slope
   c. Cation conductivity
   d. Raw/no temp correction

9.4.3 Procedure: Measurement.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.

```
Calibrate          Hold
Program         Display
```

1. Press MENU. The main menu screen appears. Choose **Program**.

```
Outputs            Temp
Measurement          >>
```

2. Choose **Measurement**.

```
Measure?           Cond
Resistivity          >>
```

```
Measure?
TDS       Custom     >>
```

3. Choose **Conductivity**, **Resistivity**, **TDS**, or **Custom**.
   If you chose **Conductivity** or **Resistivity**, do steps 5 through 7.
   If you chose **TDS**, no further measurement programming is required.
   If you chose **Custom**, see Quick Start, step 8.

```
Unit?        (µS  mS)/cm
(µS  mS  S)/m
```

4. For **Conductivity**, select measurement units: (µS, mS)/cm or (µS, mS, S)/m

```
Temp Correction?
Slope     Cation     >>
```

```
Temp Correction?
Raw/None             >>
```

```
Temp Correction?
NeutralSalt          >>
```

5. Choose **slope**, **cation**, **raw/none**, or **neutral salt** for temperature correction.

```
Temperature
Slope?   2.00%/ C
```

6. If you chose **Slope**, enter the linear conductivity change in percent per degrees (C or F). Press ENTER.

7. To return to the main display, press MENU followed by EXIT.

9.5 CHOOSING TEMPERATURE UNITS AND MANUAL OR AUTOMATIC TEMPERATURE COMPENSATION

9.5.1 Purpose

This section describes how to do the following:

1. Choose temperature display units (°C or °F).
2. Choose automatic or manual temperature compensation.
3. Enter a temperature for manual temperature compensation

9.5.2 Definitions

1. AUTOMATIC TEMPERATURE COMPENSATION. The analyzer uses a temperature-dependent factor to convert raw conductivity to temperature-compensated conductivity. In automatic temperature compensation, the analyzer measures the temperature and automatically calculates the correct conversion factor unless **Slope** (user-entered) or **Raw/None** was selected. For maximum accuracy, use automatic temperature compensation.
2. MANUAL TEMPERATURE COMPENSATION. In manual temperature compensation, the analyzer converts raw conductivity to temperature-compensated conductivity using the temperature entered by the user. It does not use the actual process temperature. Do **NOT** use manual temperature compensation unless the process temperature varies no more than about ±2°C or the pH is between 6 and 8. Manual temperature compensation is useful if the sensor temperature element has failed and a replacement sensor is not available. If manual temperature correction is selected, the display will not show the measured temperature. It will show the manually entered value.

9.5.3 Procedure: Temperature.

To choose a menu item, move the cursor to the item and press ENTER.
To store a number or setting, press ENTER.

```
Calibrate          Hold
Program         Display
```

1. Press MENU. The main menu screen appears. Choose **Program**.

```
Outputs            Temp
Measurement          >>
```

2. Choose **Temp.**

```
Config Temp?
°C/F        Live/Manual
```

3. Choose **°C/F** to change temperature units. Choose **Live/Manual** to turn on (Live) or turn off (Manual) automatic temperature compensation.
   a. If **°C/F** is chosen, select **°C** or **°F** in the next screen.
   b. If **Live/Manual** is chosen, select **Live** or **Manual** in the next screen.
   c. If **Manual** is chosen, enter the temperature in the next screen. The temperature entered in this step will be used in all subsequent measurements, no matter what the process temperature is.

9.6 SETTING A SECURITY CODE

9.6.1 Purpose

This section describes how to set a security code. There are three levels of security:

a. A user can view the default display and information screens only.

b. A user has access to the calibration and hold menus only.

c. A user has access to all menus.

The security code is a three-digit number. The table shows what happens when security codes are assigned to **Calib** (calibration) and **Config** (configure). In the table XXX and YYY are the assigned security codes. To bypass security, enter 555.

Code assignments		
Calib	**Config**	**What happens**
000	XXX	User enters XXX and has access to all menus.
XXX	YYY	User enters XXX and has access to calibration and hold menus only. User enters YYY and has access to all menus.
XXX	000	User needs no security code to have access to all menus.
000	000	User needs no security code to have access to all menus.

9.6.2 Procedure: Setting a security code

```
Calibrate          Hold
Program         Display
```

1. Press MENU. The menu screen appears. Choose **Program**.

```
Outputs            Temp
Measurement          >>
```

2. Choose **>>**.

```
Security           HART
Reset Analyzer       >>
```

3. Choose **Security**.

```
Lock?
Calib            Config
```

4. Choose **Calib** or **Config**.

   a. If you chose **Calib**, enter a three-digit security code.

   b. If you chose **Config**, enter a three-digit security code.

5. To return to the main display, press MENU the EXIT.

9.7 MAKING HART RELATED SETTINGS

For more information refer to Section 6.0.

9.8 RESETTING FACTORY CALIBRATION AND FACTORY DEFAULT SETTINGS

9.8.1 Purpose

This section describes how to install factory calibration and default values. The process also clears all fault messages and returns the display to the first quick start screen.

9.8.2 Procedure: Installing default settings

```
Calibrate        Hold
Program       Display
```

1. Press MENU. The menu screen appears. Choose **Program**.

```
Outputs          Temp
Measurement        >>
```

2. Choose **>>**.

```
Security         HART
Reset Analyzer     >>
```

3. Choose **ResetTransmitter**.

```
Load factory
settings?  Yes     No
```

4. Choose **Yes** or **No**. Choosing **Yes** clears previous settings and calibrations and returns the transmitter to the first quick start screen.

9.9 SELECTING A DEFAULT SCREEN AND SCREEN CONTRAST

9.9.1 Purpose

This section describes how to do the following:

1. Set a default screen. The default screen is the screen shown during normal operation. The Solu Comp Xmt allows the user to choose from a number of screens. Which screens are available depends on the measurement the transmitter is making.
2. Change the screen contrast.

9.9.2 Procedure: Choosing a display screen.

```
Calibrate          Hold
Program         Display
```

```
Default Display
Display Contrast
```

1. Press MENU. The menu screen appears. Choose **Display**.
2. Choose **Default Display**.
3. Press ↓ until the desired screen appears. Press ENTER. One of two display screen layouts can be selected for any measurement selected.
4. The display returns to the screen in step 2. Press MENU then EXIT to return to the main display.

9.9.3 Procedure: Changing screen contrast.

```
Calibrate          Hold
Program         Display
```

```
Default Display
Display Contrast
```

```
Display contrast
Lighter          Darker
```

1. Press MENU. The menu screen appears. Choose **Display**.
2. Choose **Display Contrast**.
3. To increase the contrast, select **darker**. Press ENTER. Each key press increases the contrast. To reduce the contrast, select **lighter**, Press ENTER. Each key press decreases the contrast.

4. To return to the main display, press MENU then EXIT.

NOTE:
Screen contrast can also be adjusted from the main display. Press MENU and ↑ at the same time to increase contrast. Press MENU and ↓ at the same time to decrease contrast. Repeatedly pressing the arrow key increases or reduces the contrast.

SECTION 10.0
MAINTENANCE

10.1 OVERVIEW

The Solu Comp Xmt needs little routine maintenance. The calibration of the analyzer and sensor should be checked periodically. To recalibrate the sensor and analyzer, refer to sections 7 through 9.

10.2 REPLACEMENT PARTS

Only a few components of the analyzer are replaceable. Refer to the tables below. Circuit boards, display, and enclosure are not replaceable.

REPLACEMENT PARTS FOR SOLU COMP XMT (PANEL MOUNT VERSION)

PART NUMBER	DESCRIPTION	SHIPPING WEIGHT
23823-00	Panel mounting kit, includes four brackets and four set screws	1 lb/0.5 kg
33654-00	Gasket, front, for panel mount version	1 lb/0.5 kg
33658-00	Gasket, rear cover, for panel mount version	1 lb/0.5 kg

REPLACEMENT PARTS FOR SOLU COMP XMT (PIPE/SURFACE MOUNT VERSION)

PART NUMBER	DESCRIPTION	SHIPPING WEIGHT
33655-00	Gasket for pipe/surface mount version	1 lb/0.5 kg
23833-00	Surface mount kit, consists of four self tapping screws and four O-rings	1 lb/0.5 kg

SECTION 11.0
THEORY OF OPERATION

11.1 CONDUCTIVITY / RESISTIVITY / % CONCENTRATION

Liquids can only conduct electrical currents when they contain particles that carry charges. These particles are called ions, and they are produced when acids, bases, and salts are mixed with water. The conductivity of a substance determines how well it can carry electrical currents and is used to indicate the concentration of acids, bases, and salts in water.

Conductance is the reciprocal of resistance. The traditional unit of conductance is mho, a term representing the reciprocal of ohm. Recently, the unit siemen has replaced the mho, but the amount of conductance is exactly the same. Liquid water has relatively low conductivity, so measurements are expressed in millisiemens (.001 siemen) or microsiemens (.000001 siemen), and abbreviated as mS or µS, respectively.

The Model Xmt-C conductivity transmitter is a device used to measure conductivity in most chemical processes. Conductivity is a function of ion concentration, ionic charge, and ion mobility. Ions in water conduct current when an electrical potential is applied across electrodes immersed in the solution.

Model Xmt-C conductivity transmitter uses conductivity probes with electrodes (contacting). Model Xmt-T is designed for use with inductive (toroidal) probes for measurement of high conductivity. Generally, contacting (electrode) probes are used for conductivity below 200 microsiemens, such as water rinses in metal finishing or ultra-pure boiler water applications. The electrode design is more sensitive for low level measurement and these water solutions tend to be non-fouling.

For % concentration measurement, the Model Xmt-C transmitter uses the measured temperature and absolute conductivity and applies specific algorithms that have been developed for each of the substances available in the instrument.

11.2 TEMPERATURE CORRECTION

The conductivity of an electrolyte solution depends strongly on temperature. To allow comparison among measurements made at different temperatures, conductivity values are usually converted to the value at 25°C. The Model Xmt-C performs the correction automatically following one of three temperature correction algorithms.

1. User-programmable linear temperature coefficient (slope)
2. Ultra-pure water
3. Cation conductivity (dilute hydrochloric acid)

Temperature correction can also be turned off. If temperature correction is off, the Model Xmt-C displays the raw or non-temperature corrected conductivity. Temperature corrections apply whether the measurement is in conductivity or resistivity units.

DEFINITIONS

1. LINEAR TEMPERATURE COEFFICENT OR TEMPERATURE SLOPE. The change in the conductivity of most electrolyte solutions having conductivity greater than about 5 mS/cm at 25°C can be expressed by the following equation:

$$C_{25} = \frac{C_t}{1 + a(t- \ 25)}$$

In the equation, C_{25} is the conductivity at 25°C, C_t is the conductivity at t°C, and a is the linear temperature coefficent. The linear temperature coefficent, sometimes called the temperature slope, has units of %/°C. In the equation, the temperature coefficent is expressed as a decimal fraction. The linear temperature coefficent depends to some extent on both the temperature and the concentration of the salt solution. The temperature coefficient also varies from salt to salt.

For maximum accuracy, the temperature coefficent must be appropriate for the salt or salts in solution, their concentration, and the temperature. Frequently the relationship must be determined by experiment. Fortunately, for most dilute neutral electrolyte solutions, a linear temperature coefficent of 2.00%/°C (0.0200) works reasonably well. The table below gives typical ranges for different electrolytes.

	Slope (%/°C)
Neutral salts	1.8 - 3.0
Acids	1.0 - 1.6
Bases	1.8 - 2.2
High purity water	Use standard correction

Temperature compensated conductivity measurements are important in the power industry. The table lists temperature slopes for different types of treatment chemicals. The slopes apply across the range of concentrations typically encountered.

	Slope (%/°C)
Condensate treated with ammonia	2.00
Boiler water treated with phosphate/caustic	2.00

2. CATION TEMPERATURE CORRECTION. Cation conductivity, sometimes called acid conductance, is used in steam power plants to measure salt contamination in the boiler feedwater and steam. The Model Xmt-C automatically corrects for the variation in the conductivity of extremely dilute hydrochloric acid with temperature and displays cation conductivity measurements. Cation conductivity temperature also applies to semiconductor etch rinse baths, which contain trace amounts of acids.
3. RAW. Raw conductivity is the conductivity of the sample at the measurement temperature.

SECTION 12.0
THEORY - REMOTE COMMUNICATIONS

12.1 OVERVIEW OF HART COMMUNICATION

HART (highway addressable remote transducer) is a digital communication system in which two frequencies are superimposed on the 4 to 20 mA output signal from the transmitter. A 1200 Hz sine wave represents the digit 1, and a 2400 Hz sine wave represents the digit 0. Because the average value of a sine wave is zero, the digital signal adds no dc component to the analog signal. HART permits digital communication while retaining the analog signal for process control.

The HART protocol, originally developed by Fisher-Rosemount, is now overseen by the independent HART Communication Foundation. The Foundation ensures that all HART devices can communicate with one another. For more information about HART communications, call the HART Communication Foundation at (512) 794-0369. The internet address is *http://www.hartcomm.org*.

12.2 HART INTERFACE DEVICES

HART communicators allow the user to view measurement data (conductivity readings and temperature), program the transmitter, and download information from the transmitter for transfer to a computer for analysis. Downloaded information can also be sent to another HART transmitter. Either a hand-held communicator, such as the Rosemount Model 275, or a computer can be used. HART interface devices operate from any wiring termination point in the 4 - 20 mA loop. A minimum load of 250 ohms must be present between the transmitter and the power supply. See Figure 12-1.

If your communicator does not recognize the Model XMT-C transmitter, the device description library may need updating. Call the manufacturer of your HART communication device for updates.

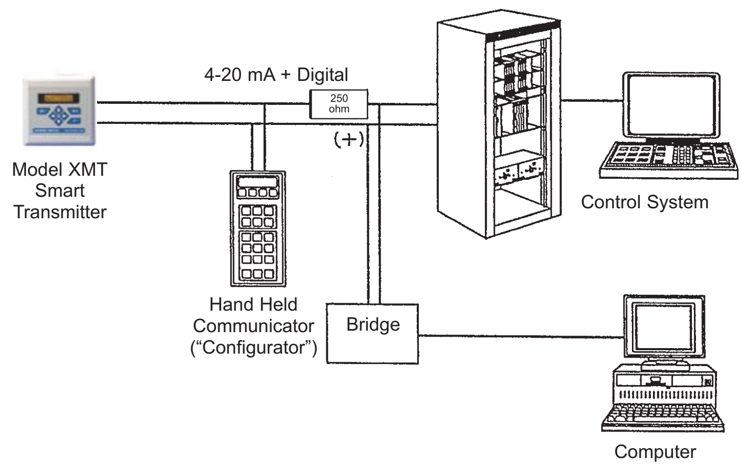


FIGURE 12-1. HART Communicators.

Both the Rosemount Model 375 or 275 and a computer can be used to communicate with a HART transmitter. The 250 ohm load (minimum) must be present between the transmitter and the power supply.

12.3 ASSET MANAGEMENT SOLUTIONS

Asset Management Solutions (AMS) is software that helps plant personnel better monitor the performance of analytical instruments, pressure and temperature transmitters, and control valves. Continuous monitoring means maintenance personnel can anticipate equipment failures and plan preventative measures before costly breakdown maintenance is required.

AMS uses remote monitoring. The operator, sitting at a computer, can view measurement data, change program settings, read diagnostic and warning messages, and retrieve historical data from any HART-compatible device, including the Model XMT-C transmitter. Although AMS allows access to the basic functions of any HART compatible device, Rosemount Analytical has developed additional software for that allows access to all features of the Model XMT-C transmitter.

AMS can play a central role in plant quality assurance and quality control. Using AMS Audit Trail, plant operators can track calibration frequency and results as well as warnings and diagnostic messages. The information is available to Audit Trail whether calibrations were done using the infrared remote controller, the Model 375 or 275 HART communicator, or AMS software.

AMS operates in Windows 95. See Figure 12-2 for a sample screen. AMS communicates through a HART-compatible modem with any HART transmitters, including those from other manufacturers. AMS is also compatible with FOUNDATION™ Fieldbus, which allows future upgrades to Fieldbus instruments.

For more information about AMS, including upgrades, renewals, and training, call Fisher-Rosemount Systems, Inc. at (612) 895-2000.

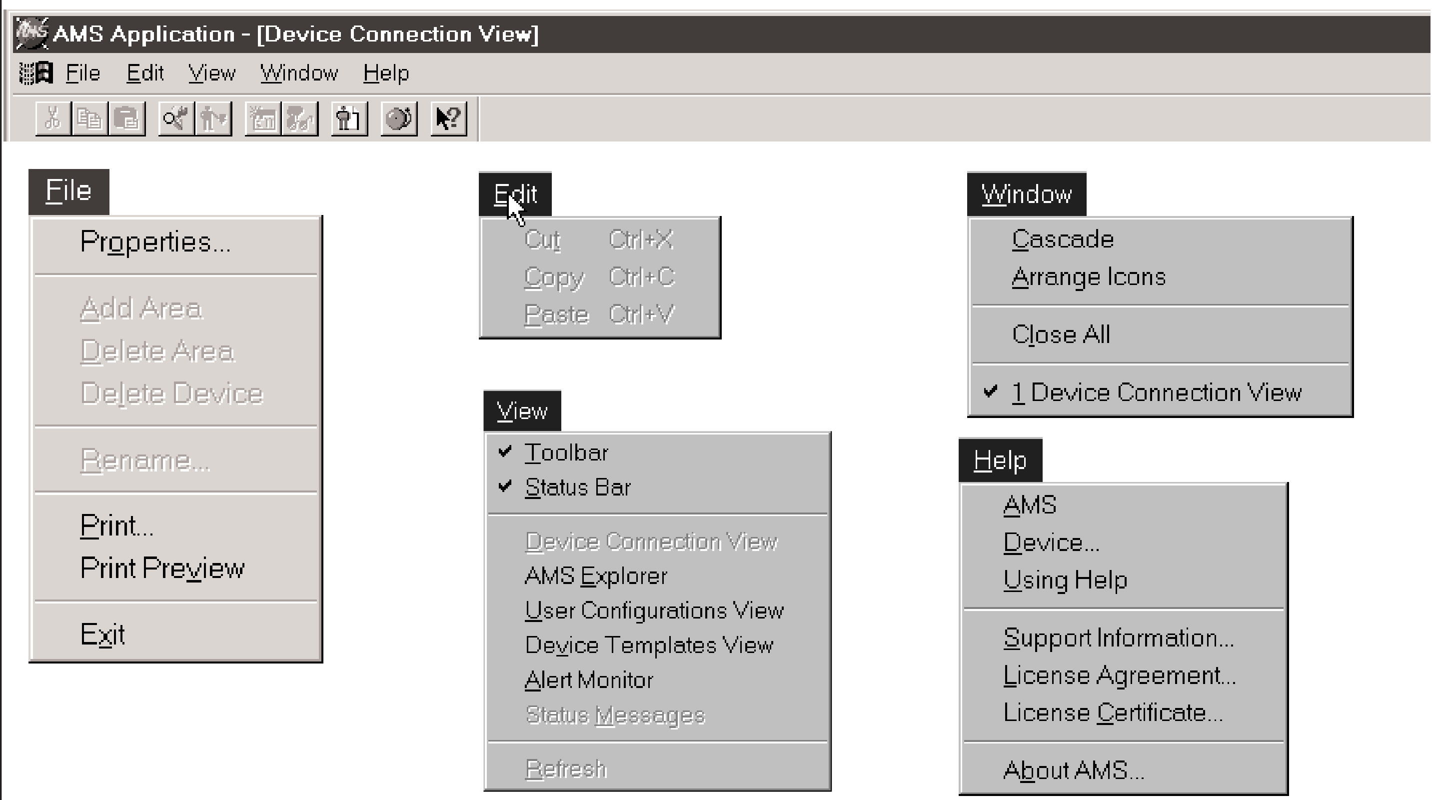


FIGURE 12-2. AMS Main Menu Tools

SECTION 13.0
RETURN OF MATERIAL

13.1 GENERAL.

To expedite the repair and return of instruments, proper communication between the customer and the factory is important. Call 1-949-757-8500 for a Return Materials Authorization (RMA) number.

13.2 WARRANTY REPAIR.

The following is the procedure for returning instruments still under warranty:

1. Call Rosemount Analytical for authorization.
2. To verify warranty, supply the factory sales order number or the original purchase order number. In the case of individual parts or sub-assemblies, the serial number on the unit must be supplied.
3. Carefully package the materials and enclose your "Letter of Transmittal" (see Warranty). If possible, pack the materials in the same manner as they were received.
4. Send the package prepaid to:

   Emerson Process Management
   Liquid Division
   2400 Barranca Parkway
   Irvine, CA 92606

   Attn: Factory Repair

   RMA No. ____________

   Mark the package: Returned for Repair

   Model No. ____

13.3 NON-WARRANTY REPAIR.

The following is the procedure for returning for repair instruments that are no longer under warranty:

1. Call Rosemount Analytical for authorization.
2. Supply the purchase order number, and make sure to provide the name and telephone number of the individual to be contacted should additional information be needed.
3. Do Steps 3 and 4 of Section 13.2.

NOTE

Consult the factory for additional information regarding service or repair.

WARRANTY

Goods and part(s) (excluding consumables) manufactured by Seller are warranted to be free from defects in workmanship and material under normal use and service for a period of twelve (12) months from the date of shipment by Seller. Consumables, pH electrodes, membranes, liquid junctions, electrolyte, O-rings, etc. are warranted to be free from defects in workmanship and material under normal use and service for a period of ninety (90) days from date of shipment by Seller. Goods, part(s) and consumables proven by Seller to be defective in workmanship and / or material shall be replaced or repaired, free of charge, F.O.B. Seller's factory provided that the goods, parts(s), or consumables are returned to Seller's designated factory, transportation charges prepaid, within the twelve (12) month period of warranty in the case of goods and part(s), and in the case of consumables, within the ninety (90) day period of warranty. This warranty shall be in effect for replacement or repaired goods, part(s) and consumables for the remaining portion of the period of the twelve (12) month warranty in the case of goods and part(s) and the remaining portion of the ninety (90) day warranty in the case of consumables. A defect in goods, part(s) and consumables of the commercial unit shall not operate to condemn such commercial unit when such goods, parts(s) or consumables are capable of being renewed, repaired or replaced.

The Seller shall not be liable to the Buyer, or to any other person, for the loss or damage, directly or indirectly, arising from the use of the equipment or goods, from breach of any warranty or from any other cause. All other warranties, expressed or implied are hereby excluded.

IN CONSIDERATION OF THE STATED PURCHASE PRICE OF THE GOODS, SELLER GRANTS ONLY THE ABOVE STATED EXPRESS WARRANTY. NO OTHER WARRANTIES ARE GRANTED INCLUDING, BUT NOT LIMITED TO, EXPRESS AND IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

RETURN OF MATERIAL

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

Emerson Process Management
Liquid Division
2400 Barranca Parkway
Irvine, CA 92606

The shipping container should be marked:

Return for Repair
Model ________________________________

The returned material should be accompanied by a letter of transmittal which should include the following information (make a copy of the "Return of Materials Request" found on the last page of the Manual and provide the following thereon):

1. Location type of service, and length of time of service of the device.
2. Description of the faulty operation of the device and the circumstances of the failure.
3. Name and telephone number of the person to contact if there are questions about the returned material.
4. Statement as to whether warranty or non-warranty service is requested.
5. Complete shipping instructions for return of the material.

Adherence to these procedures will expedite handling of the returned material and will prevent unnecessary additional charges for inspection and testing to determine the problem with the device.

If the material is returned for out-of-warranty repairs, a purchase order for repairs should be enclosed.

The right people,
the right answers,
right now.

ROSEMOUNT ANALYTICAL
CUSTOMER SUPPORT CENTER
1-800-854-8257

ON-LINE ORDERING NOW AVAILABLE ON OUR WEB SITE
http://www.raihome.com

Specifications subject to change without notice.

Credit Cards for U.S. Purchases Only.

Emerson Process Management

Liquid Division
2400 Barranca Parkway
Irvine, CA 92606 USA
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Fax: (949) 474-7250

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